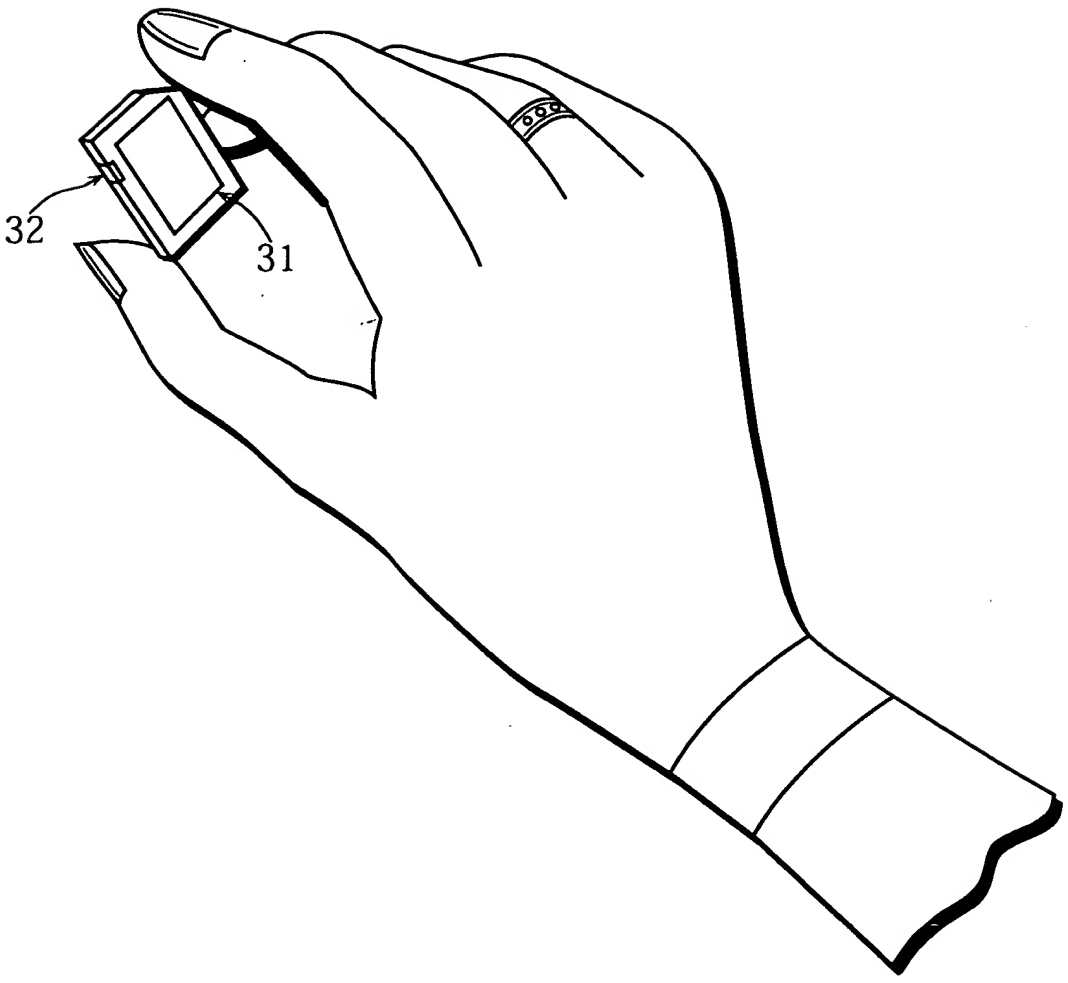
09580170 052600

FIG. 1



09526501-052600

FIG. 2

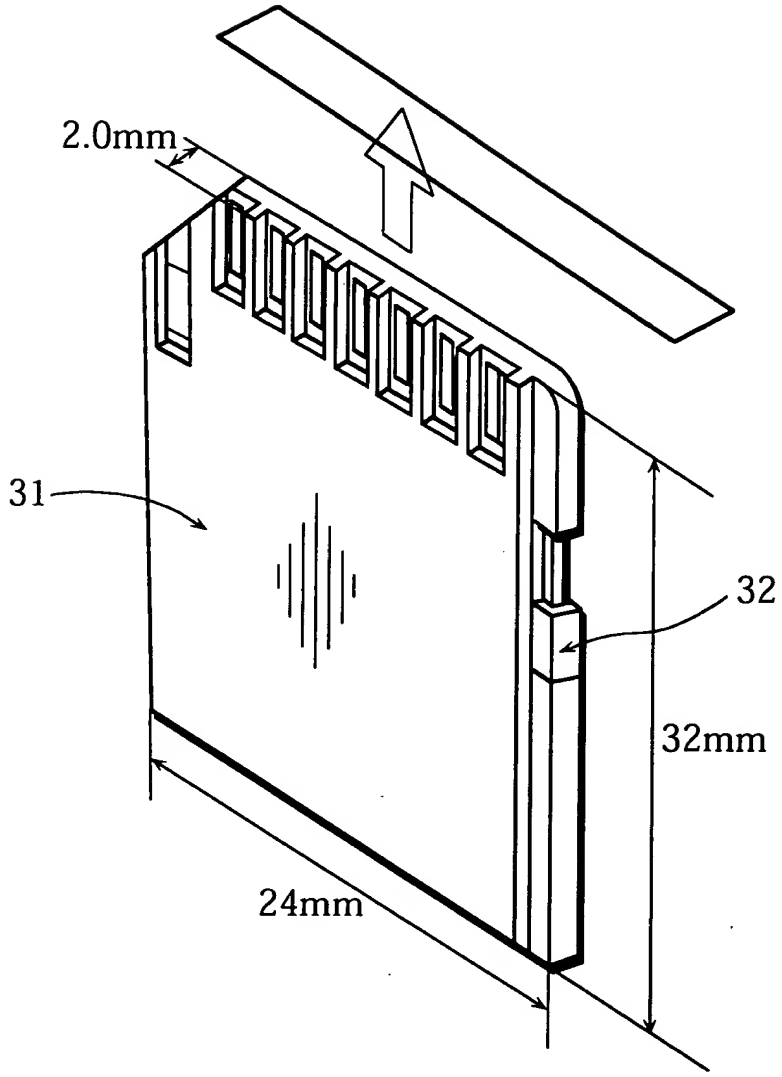


FIG. 3

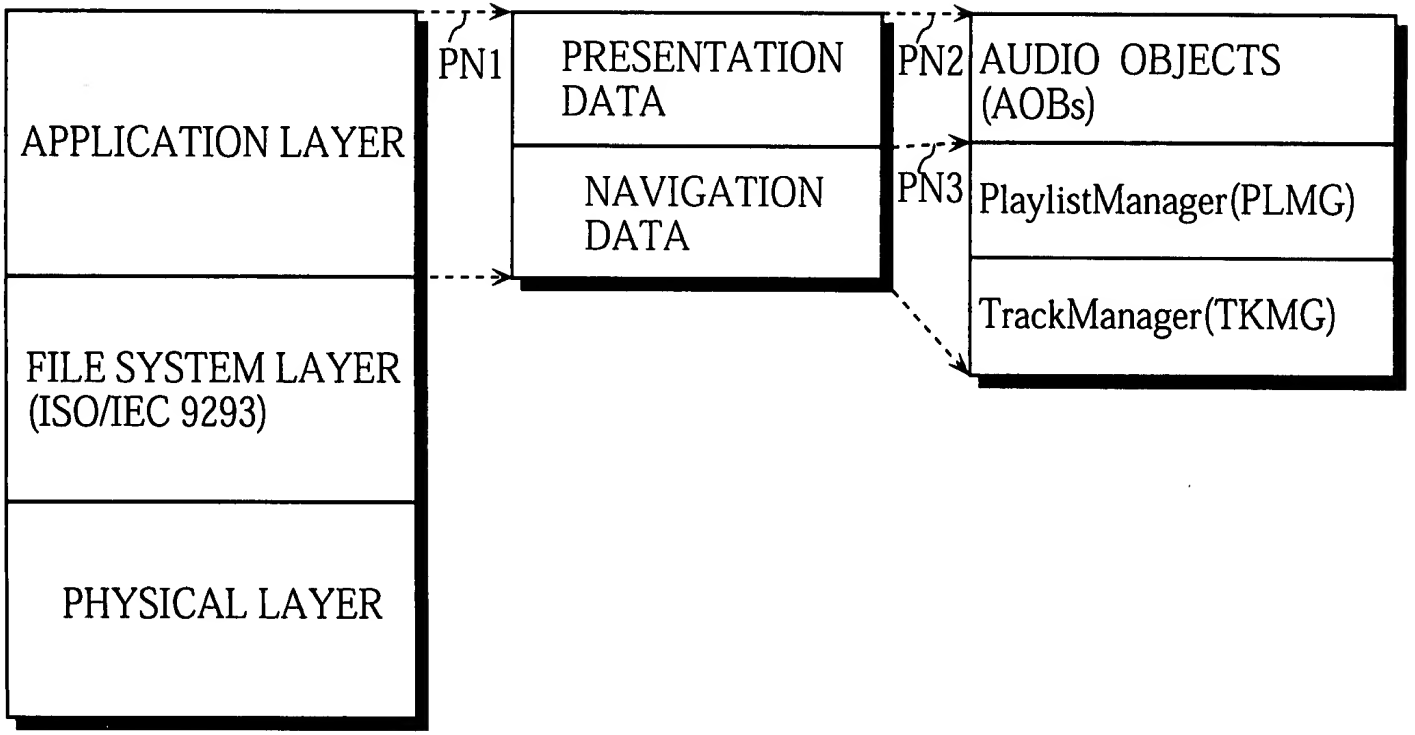

APPLICATION LAYER
FILE SYSTEM LAYER
(ISO/IEC 9293)
PHYSICAL LAYER
PN1
PRESENTATION DATA
NAVIGATION DATA
PN2
AUDIO OBJECTS
(AOBs)
PN3
PlaylistManager(PLMG)
TrackManager(TKMG)

FIG. 4A

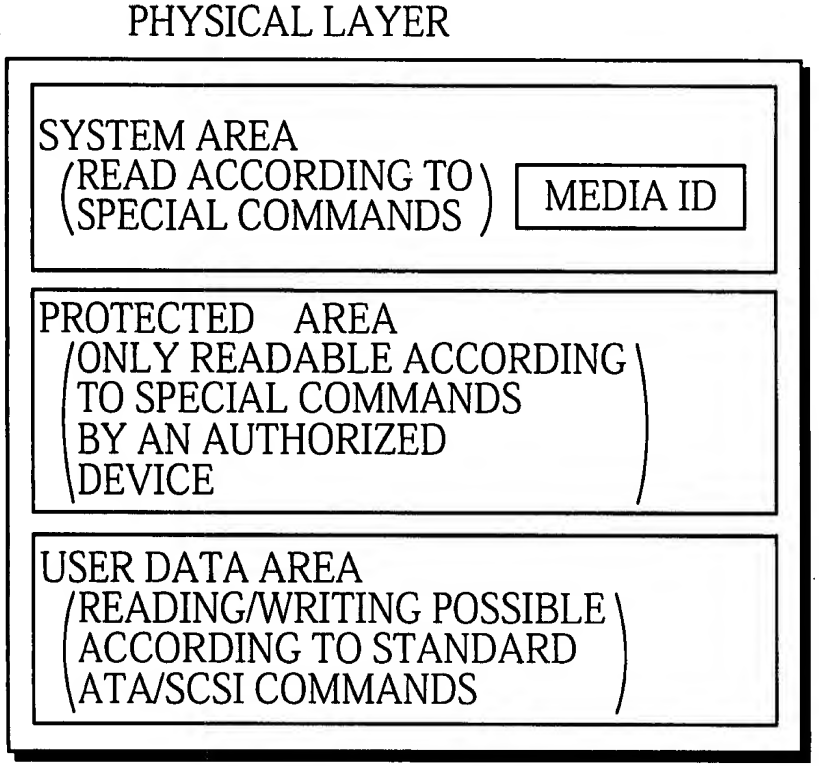

PHYSICAL LAYER
SYSTEM AREA
(READ ACCORDING TO SPECIAL COMMANDS)
MEDIA ID
PROTECTED AREA
(ONLY READABLE ACCORDING TO SPECIAL COMMANDS BY AN AUTHORIZED DEVICE)
USER DATA AREA
(READING/WRITING POSSIBLE ACCORDING TO STANDARD ATA/SCSI COMMANDS)

FIG. 4B

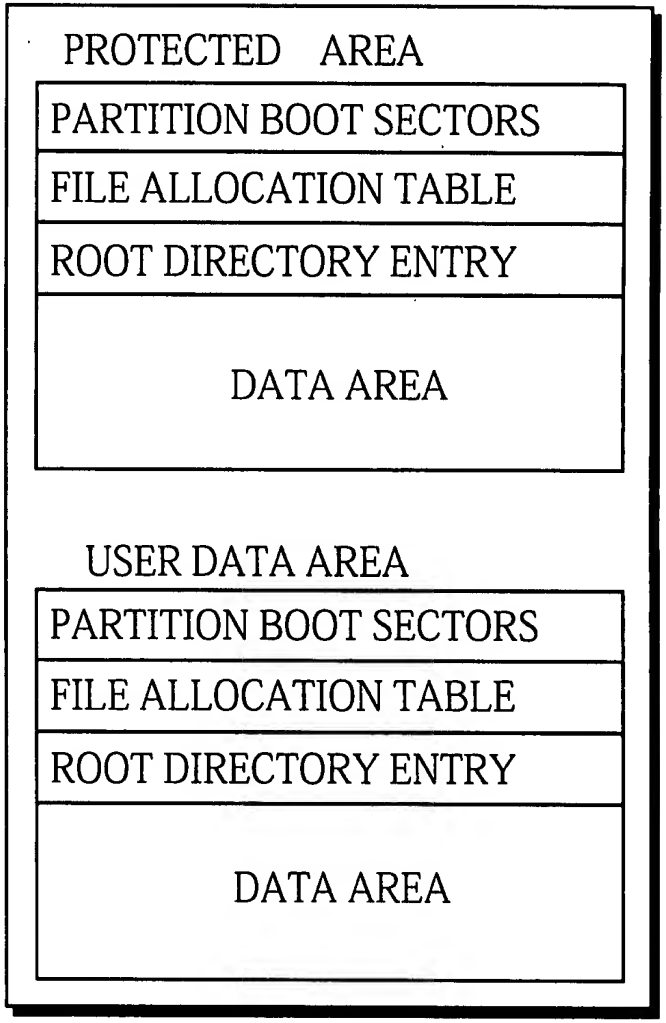

FILE SYSTEM LAYER
(ISO/IEC 9293)
PROTECTED AREA
PARTITION BOOT SECTORS
FILE ALLOCATION TABLE
ROOT DIRECTORY ENTRY
DATA AREA
USER DATA AREA
PARTITION BOOT SECTORS
FILE ALLOCATION TABLE
ROOT DIRECTORY ENTRY
DATA AREA

FIG. 5

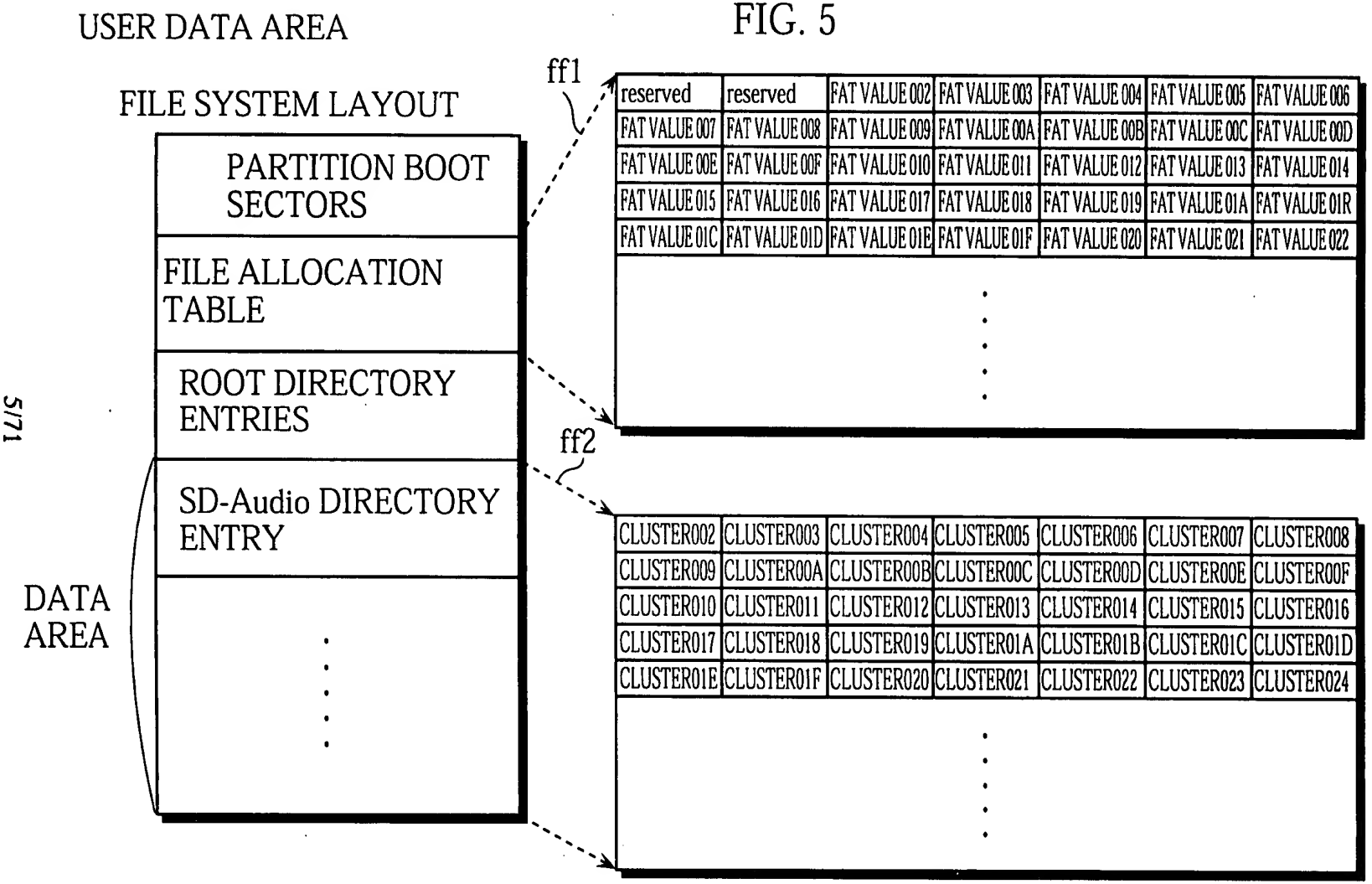

USER DATA AREA
FILE SYSTEM LAYOUT
PARTITION BOOT SECTORS
FILE ALLOCATION TABLE
ROOT DIRECTORY ENTRIES
SD-Audio DIRECTORY ENTRY
DATA AREA
ff1
ff2
reserved reserved FAT VALUE 002 FAT VALUE 003 FAT VALUE 004 FAT VALUE 005 FAT VALUE 006
FAT VALUE 007 FAT VALUE 008 FAT VALUE 009 FAT VALUE 00A FAT VALUE 00B FAT VALUE 00C FAT VALUE 00D
FAT VALUE 00E FAT VALUE 00F FAT VALUE 010 FAT VALUE 011 FAT VALUE 012 FAT VALUE 013 FAT VALUE 014
FAT VALUE 015 FAT VALUE 016 FAT VALUE 017 FAT VALUE 018 FAT VALUE 019 FAT VALUE 01A FAT VALUE 01R
FAT VALUE 01C FAT VALUE 01D FAT VALUE 01E FAT VALUE 01F FAT VALUE 020 FAT VALUE 021 FAT VALUE 022
CLUSTER002 CLUSTER003 CLUSTER004 CLUSTER005 CLUSTER006 CLUSTER007 CLUSTER008
CLUSTER009 CLUSTER00A CLUSTER00B CLUSTER00C CLUSTER00D CLUSTER00E CLUSTER00F
CLUSTER010 CLUSTER011 CLUSTER012 CLUSTER013 CLUSTER014 CLUSTER015 CLUSTER016
CLUSTER017 CLUSTER018 CLUSTER019 CLUSTER01A CLUSTER01B CLUSTER01C CLUSTER01D
CLUSTER01E CLUSTER01F CLUSTER020 CLUSTER021 CLUSTER022 CLUSTER023 CLUSTER024

FIG. 6

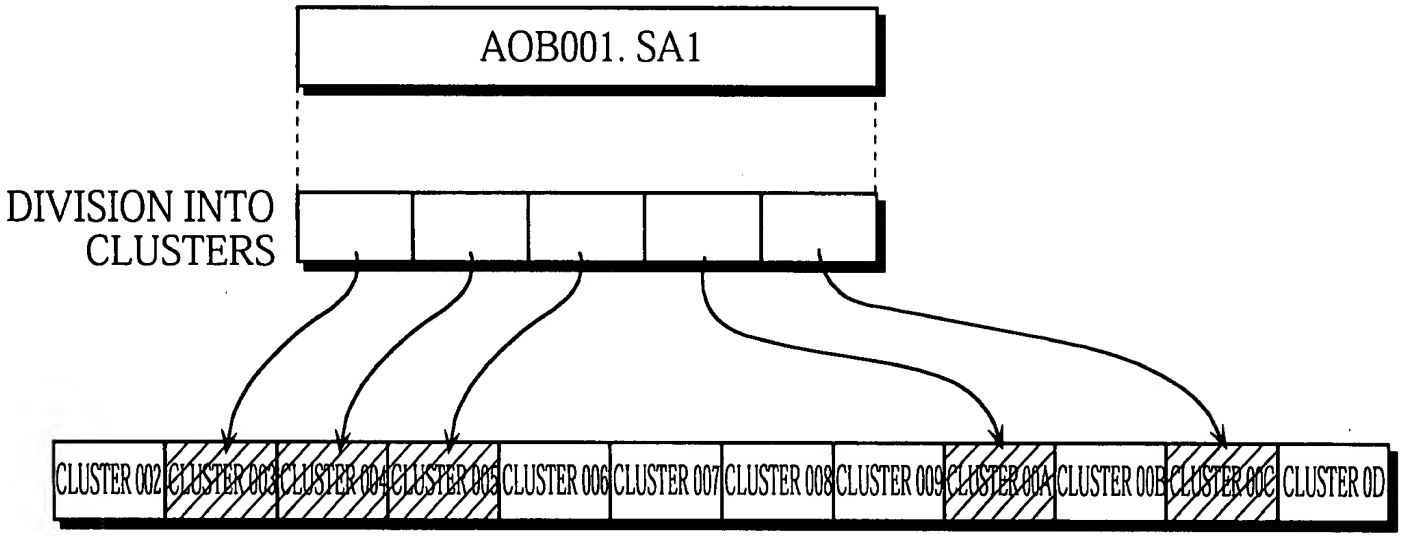

AOB001. SA1
DIVISION INTO CLUSTERS
CLUSTER 002
CLUSTER 003
CLUSTER 004
CLUSTER 005
CLUSTER 006
CLUSTER 007
CLUSTER 008
CLUSTER 009
CLUSTER 00A
CLUSTER 00B
CLUSTER 00C
CLUSTER 0D

FIG. 7

SD-Audio DIRECTORY ENTRY

FILE NAME	FILENAME EXTENSION	NUMBER OF FIRST CLUSTER IN FILE
AOB001	SA1	003

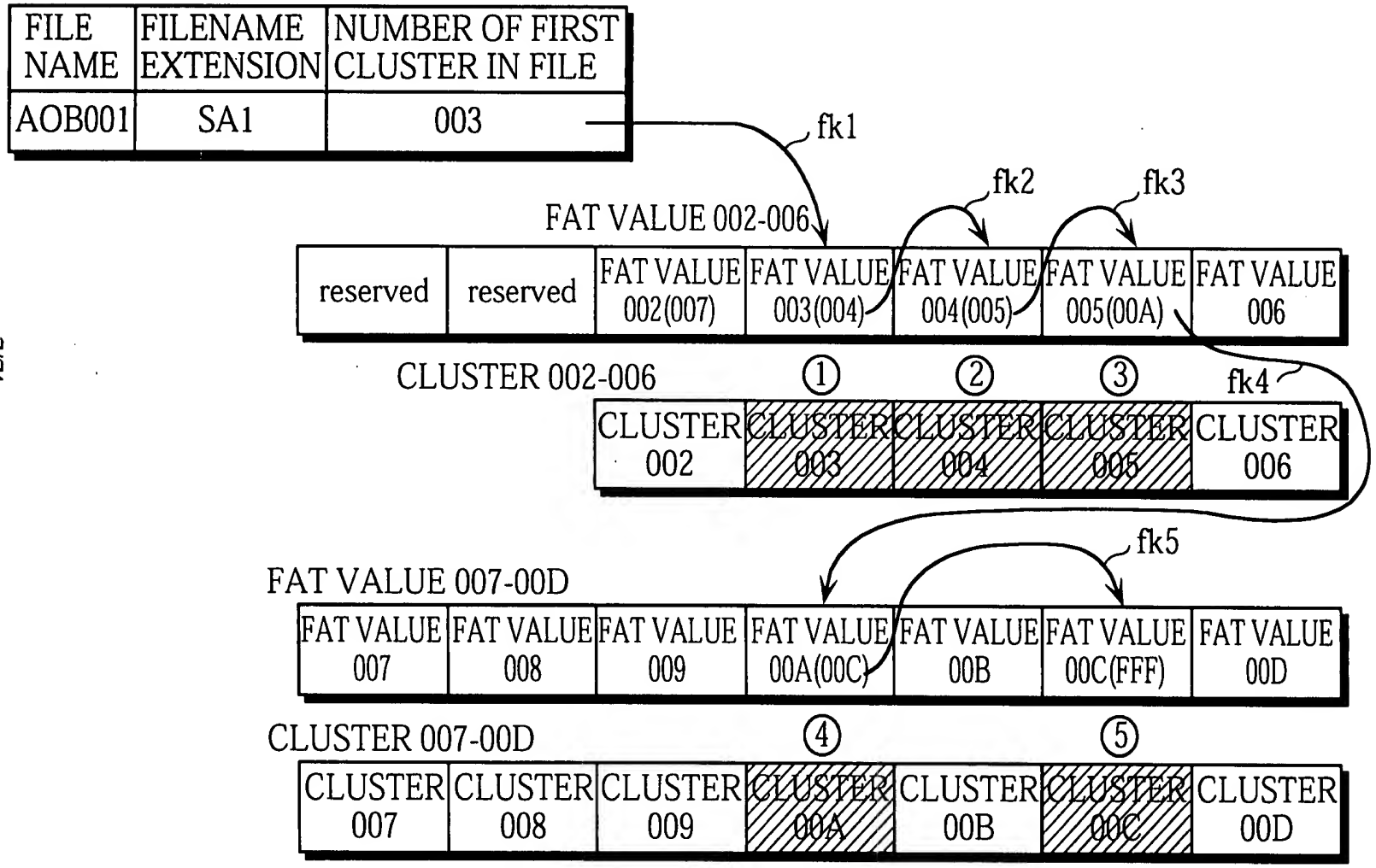


FIG. 8A

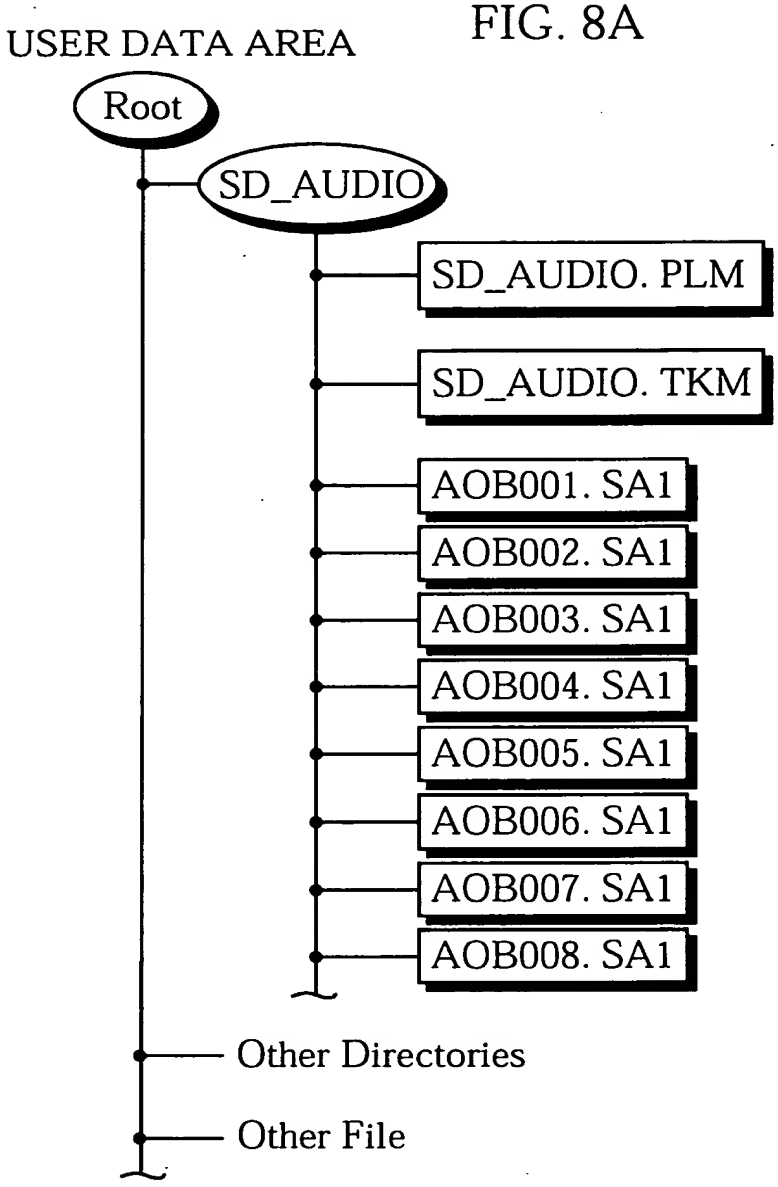
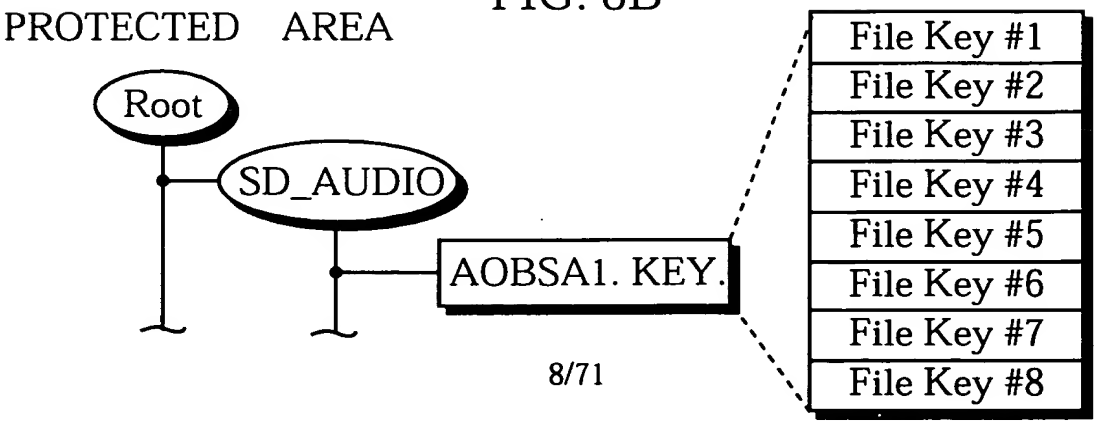


FIG. 8B



0955801.0952500

0052501 "EP0843560

FIG. 9

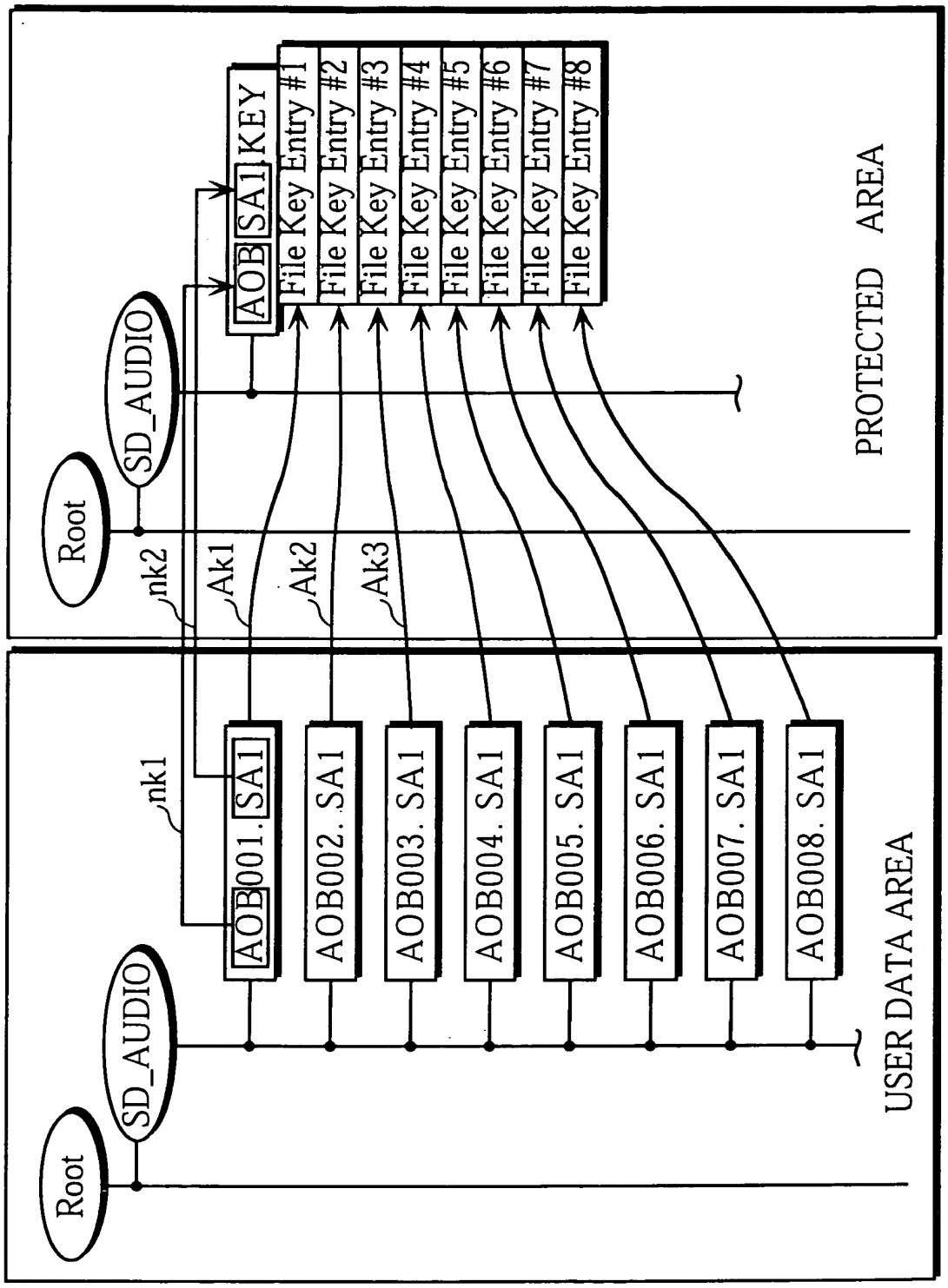


FIG. 10

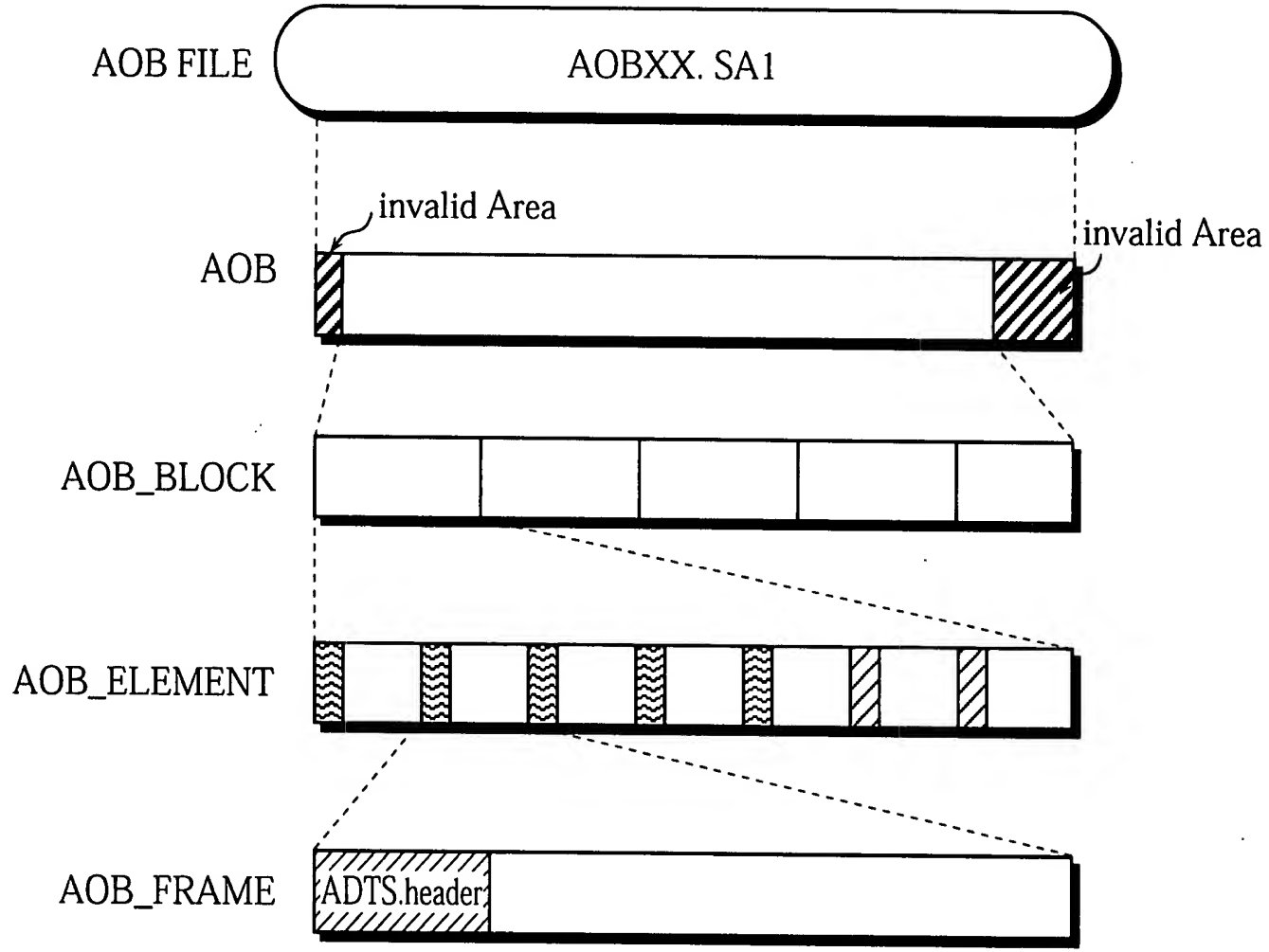

AOB FILE
AOBXX. SA1
invalid Area
invalid Area
AOB
AOB_BLOCK
AOB_ELEMENT
AOB_FRAME
ADTS.header

FIG. 11A

MPEG2-AAC format

format	Audio_Data_Transport_Stream(ADTS)
Profile	Low Complexity(LC) profile(mandatory)
bitrate per channel**	between 16kbit/s(min.)and 72kbit/s(max.) Other bitrates are optional.
sampling_frequency	48 kHz(mandatory) 44.1 kHz(mandatory) 32 kHz(mandatory) 24 kHz(mandatory) 22.05 kHz(mandatory) 16 kHz(mandatory)
channel_configuration	single_channel_element(mandatory) channel_pair_element(mandatory)
number_of_data_blocks_in_frame	1 header/1 raw_data_block(mandatory)

FIG. 11B

MPEG layer 3 format

format	MPEG-1 layer 3 MPEG-2 layer 3 low sampling frequency
bitrate per channel**	MPEG 1:between 16kbit/s and 96kbit/s MPEG 2 LSF:between 16kbit/s and 80kbit/s Other bitrates and variable bitrate are optional. Bitrate index "0000",i.e. "free format" is not supported.
sampling_frequency	48 kHz 44.1 kHz 32 kHz 24 kHz 22.05 kHz 16 kHz
mode	stereo joint_stereo single_cannel

FIG. 11C Windows Media Audio format

format	Windows Media Audio format
bitrate per channel**	between 8kbit/s and 80kbit/s Other bitrates are optional.
sampling_frequency	48 kHz 44.1 kHz 32 kHz 22.05 kHz 16 kHz
mode	monaural stereo

FIG. 12

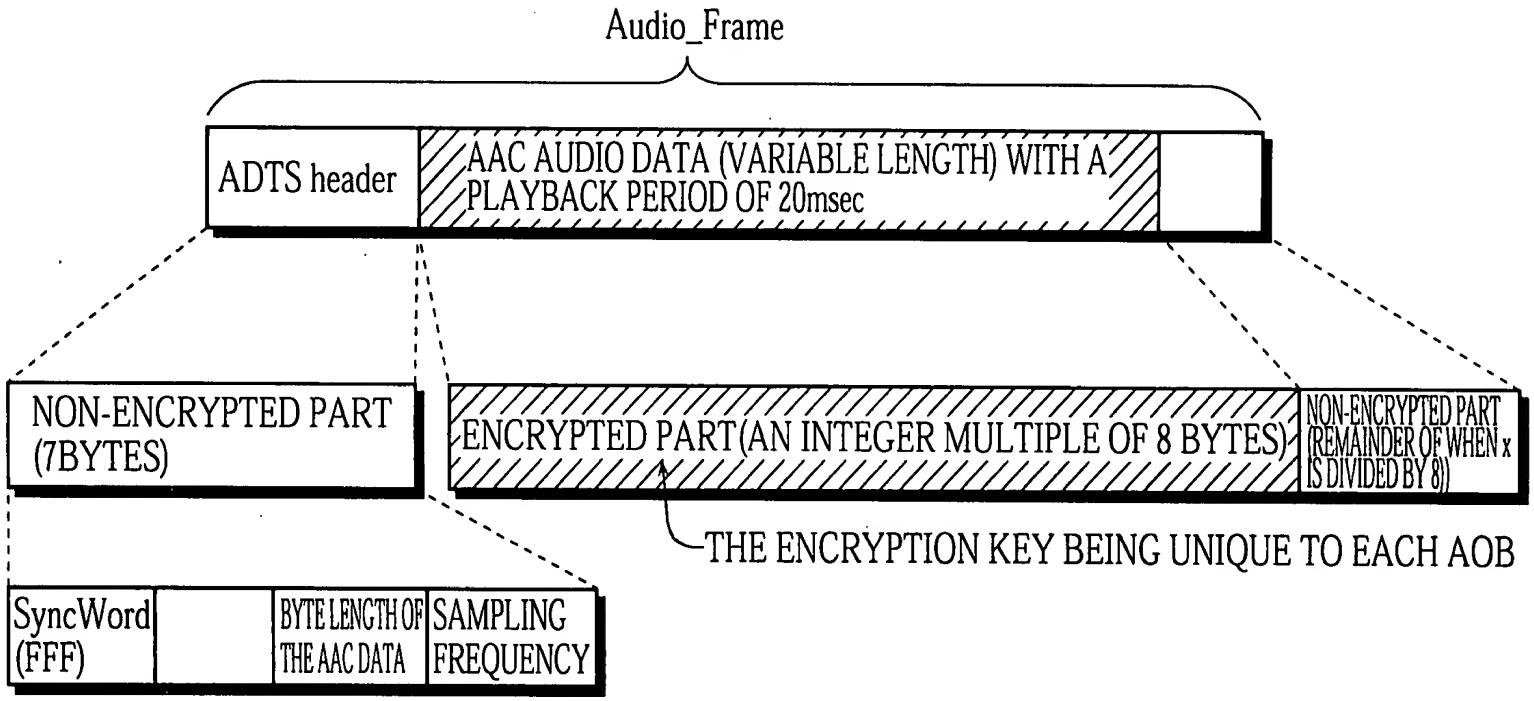
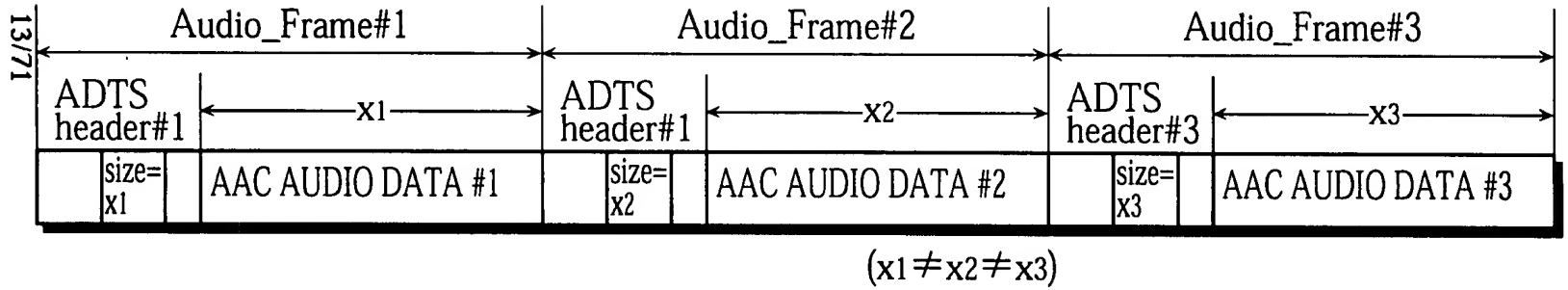

Audio_Frame
ADTS header
AAC AUDIO DATA (VARIABLE LENGTH) WITH A PLAYBACK PERIOD OF 20msec
NON-ENCRYPTED PART (7BYTES)
ENCRYPTED PART(AN INTEGER MULTIPLE OF 8 BYTES)
NON-ENCRYPTED PART (REMAINDER OF WHEN x IS DIVIDED BY 8))
THE ENCRYPTION KEY BEING UNIQUE TO EACH AOB
SyncWord (FFF)
BYTE LENGTH OF THE AAC DATA
SAMPLING FREQUENCY

FIG. 13


13/71
Audio_Frame#1
Audio_Frame#2
Audio_Frame#3
ADTS header#1
x1
ADTS header#1
x2
ADTS header#3
x3
size= x1
AAC AUDIO DATA #1
size= x2
AAC AUDIO DATA #2
size= x3
AAC AUDIO DATA #3
(x1≠x2≠x3)

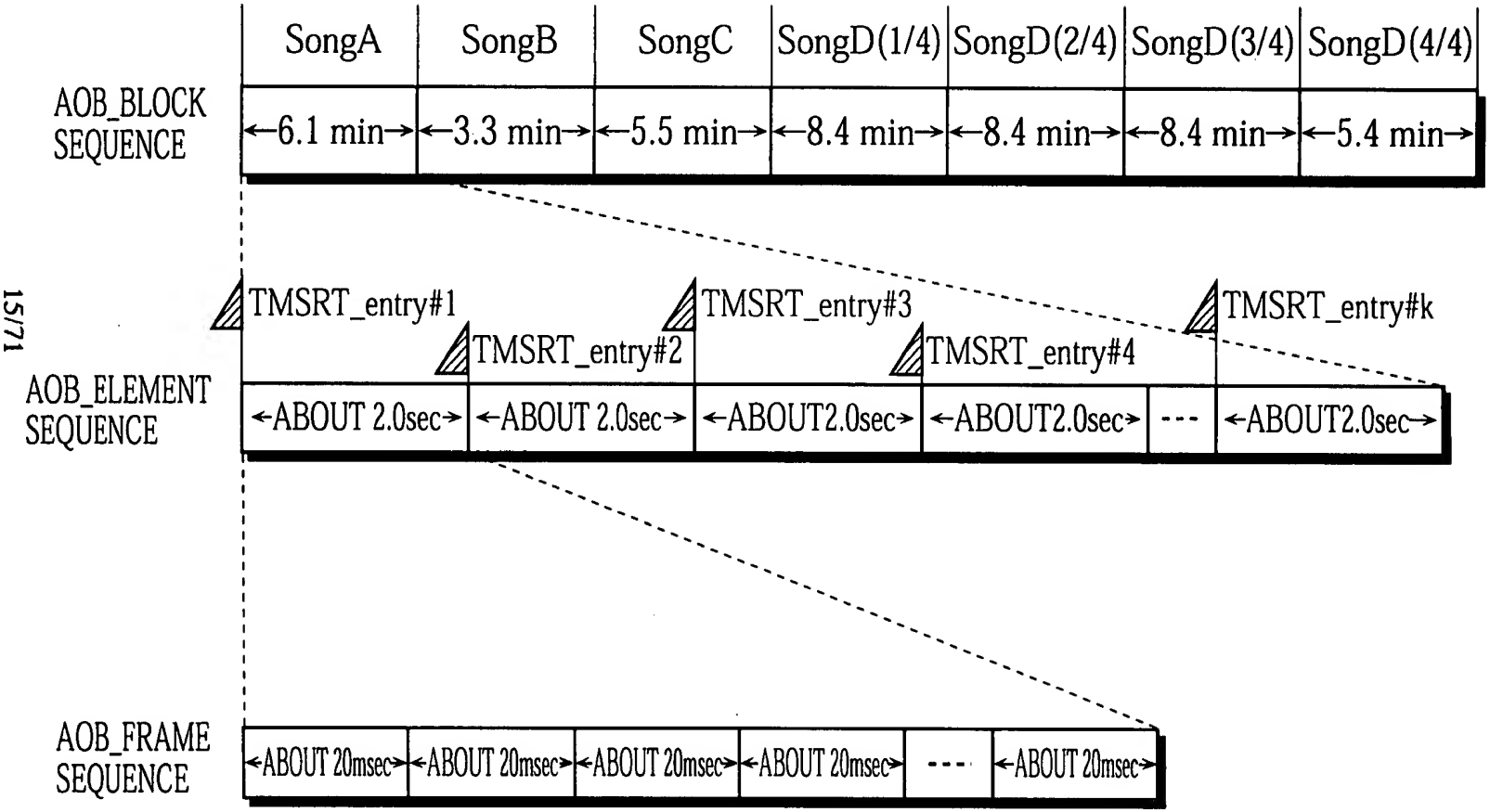
0950850-050504

FIG. 14

sampling frequency	FNs_Middle_TMSRTE		
	AAC	MPEGlayer3	WMA
48kHz	47*N	42*N	×××
44.1kHz	43*N	38*N	×××
32kHz	32*N	28*N	×××
24kHz	24*N	42*N	×××
22.05kHz	22*N	38*N	×××
16kHz	16*N	28*N	×××

※ N BEING THE PLAYBACK PERIOD "TIME_LENGTH" OF AN AOB_ELEMENT TO AN ACCURACY OF 1/1000TH OF ONE SECOND

FIG. 15


SongA
SongB
SongC
SongD(1/4)
SongD(2/4)
SongD(3/4)
SongD(4/4)
AOB_BLOCK SEQUENCE
←6.1 min→
←3.3 min→
←5.5 min→
←8.4 min→
←8.4 min→
←8.4 min→
←5.4 min→
TMSRT_entry#1
TMSRT_entry#2
TMSRT_entry#3
TMSRT_entry#4
TMSRT_entry#k
AOB_ELEMENT SEQUENCE
←ABOUT 2.0sec→
←ABOUT 2.0sec→
←ABOUT2.0sec→
←ABOUT2.0sec→

←ABOUT2.0sec→
AOB_FRAME SEQUENCE
←ABOUT 20msec→
←ABOUT 20msec→
←ABOUT 20msec→
←ABOUT 20msec→

←ABOUT 20msec→

FIG. 16

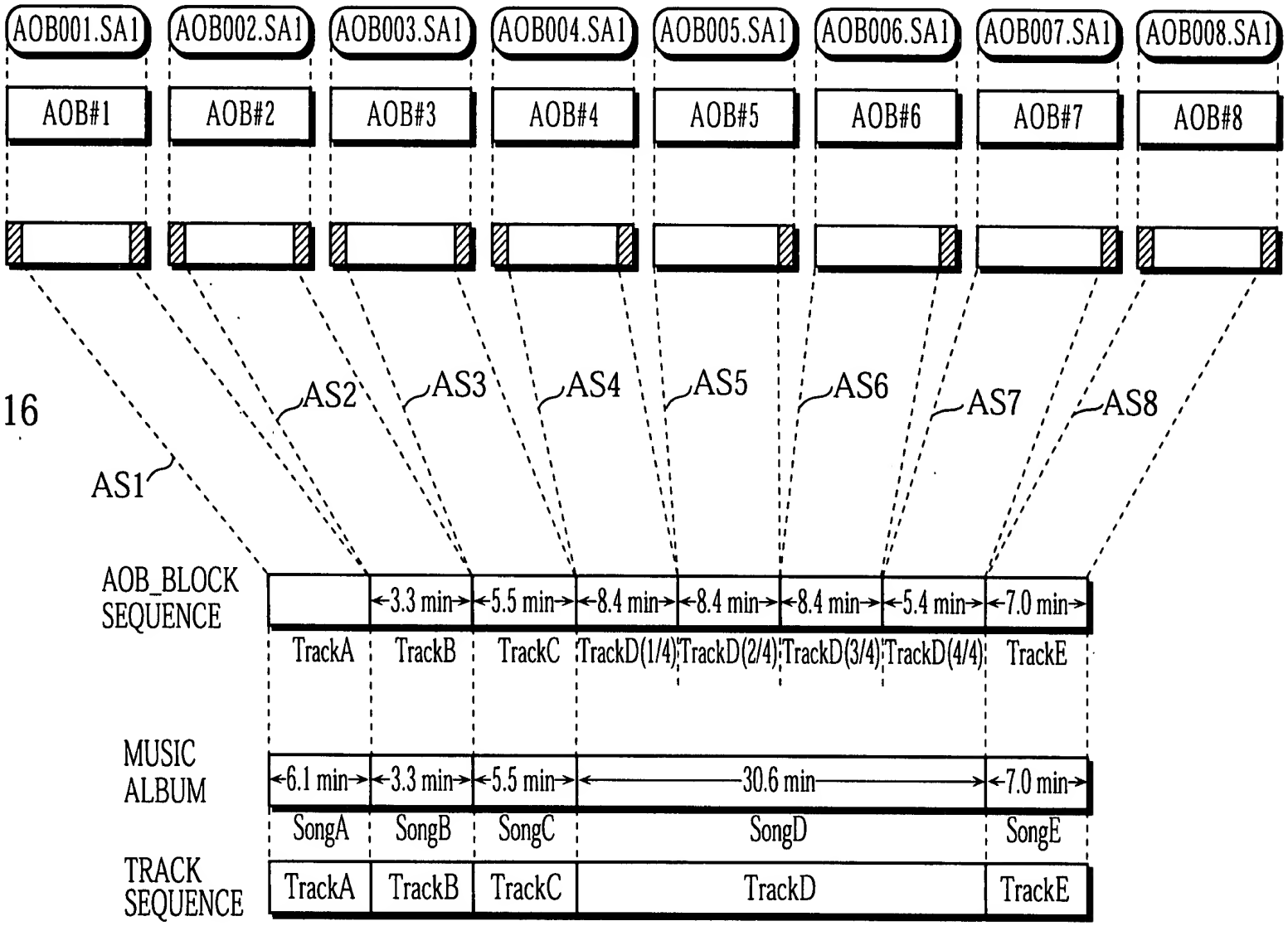

AOB001.SA1
AOB002.SA1
AOB003.SA1
AOB004.SA1
AOB005.SA1
AOB006.SA1
AOB007.SA1
AOB008.SA1
AOB#1
AOB#2
AOB#3
AOB#4
AOB#5
AOB#6
AOB#7
AOB#8
AS1
AS2
AS3
AS4
AS5
AS6
AS7
AS8
AOB_BLOCK SEQUENCE
3.3 min
5.5 min
8.4 min
8.4 min
8.4 min
5.4 min
7.0 min
TrackA
TrackB
TrackC
TrackD(1/4)
TrackD(2/4)
TrackD(3/4)
TrackD(4/4)
TrackE
MUSIC ALBUM
6.1 min
3.3 min
5.5 min
30.6 min
7.0 min
SongA
SongB
SongC
SongD
SongE
TRACK SEQUENCE
TrackA
TrackB
TrackC
TrackD
TrackE

FIG. 17

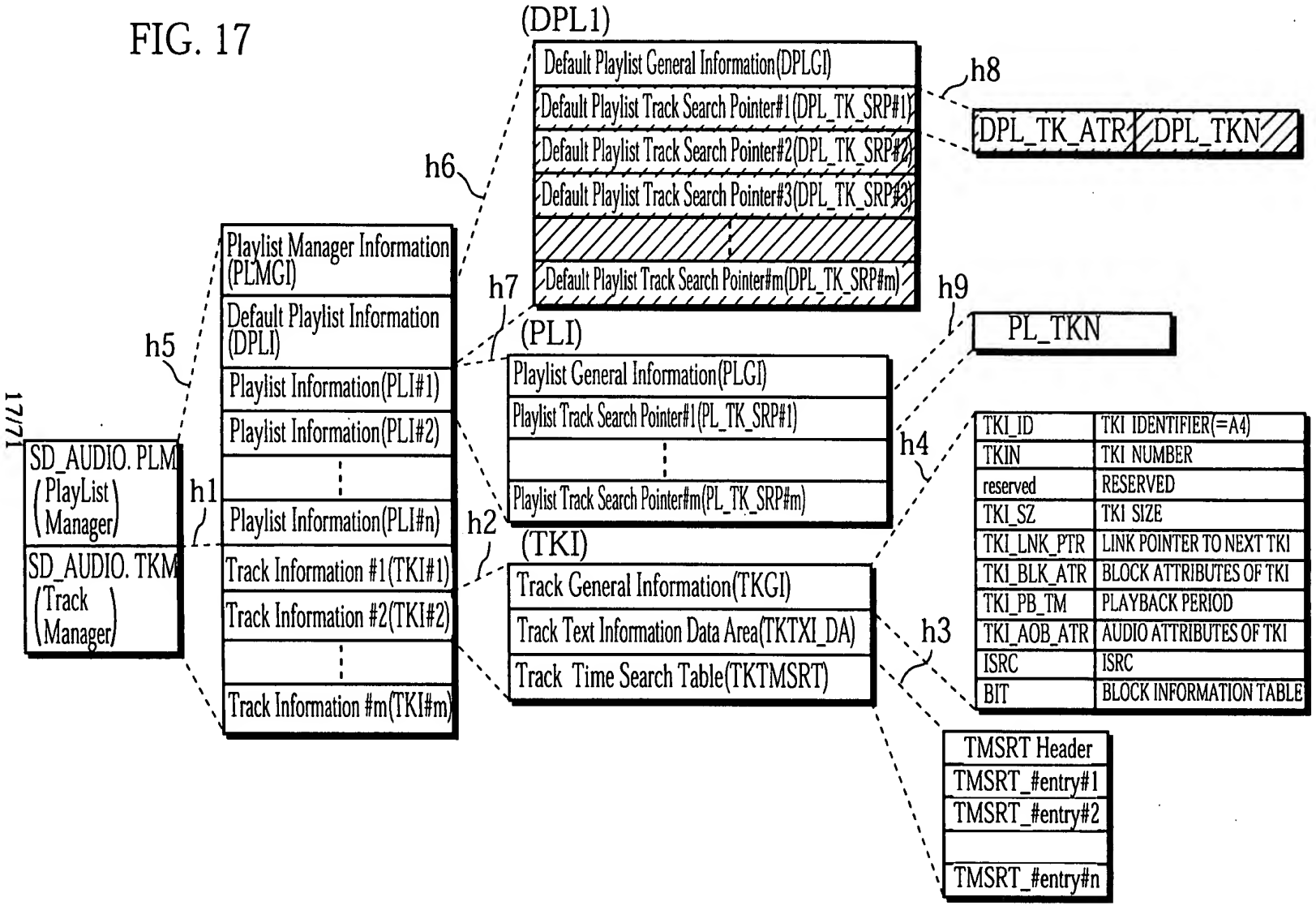

(DPL1)
Default Playlist General Information(DPLGI)
Default Playlist Track Search Pointer#1(DPL_TK_SRP#1)
Default Playlist Track Search Pointer#2(DPL_TK_SRP#2)
Default Playlist Track Search Pointer#3(DPL_TK_SRP#3)
Default Playlist Track Search Pointer#m(DPL_TK_SRP#m)
h8
DPL_TK_ATR
DPL_TKN
h6
h7
h9
PL_TKN
(PLI)
Playlist General Information(PLGI)
Playlist Track Search Pointer#1(PL_TK_SRP#1)
Playlist Track Search Pointer#m(PL_TK_SRP#m)
h4
TKI_ID
TKI IDENTIFIER(=A4)
TKIN
TKI NUMBER
reserved
RESERVED
TKI_SZ
TKI SIZE
TKI_LNK_PTR
LINK POINTER TO NEXT TKI
TKI_BLK_ATR
BLOCK ATTRIBUTES OF TKI
TKI_PB_TM
PLAYBACK PERIOD
TKI_AOB_ATR
AUDIO ATTRIBUTES OF TKI
ISRC
ISRC
BIT
BLOCK INFORMATION TABLE
h5
171
SD_AUDIO. PLM
(PlayList Manager)
SD_AUDIO. TKM
(Track Manager)
h1
Playlist Manager Information (PLMGI)
Default Playlist Information (DPLI)
Playlist Information(PLI#1)
Playlist Information(PLI#2)
Playlist Information(PLI#n)
Track Information #1(TKI#1)
Track Information #2(TKI#2)
Track Information #m(TKI#m)
h2
(TKI)
Track General Information(TKGI)
Track Text Information Data Area(TKTXI_DA)
Track Time Search Table(TKTMSRT)
h3
TMSRT Header
TMSRT_#entry#1
TMSRT_#entry#2
TMSRT_#entry#n

FIG. 18

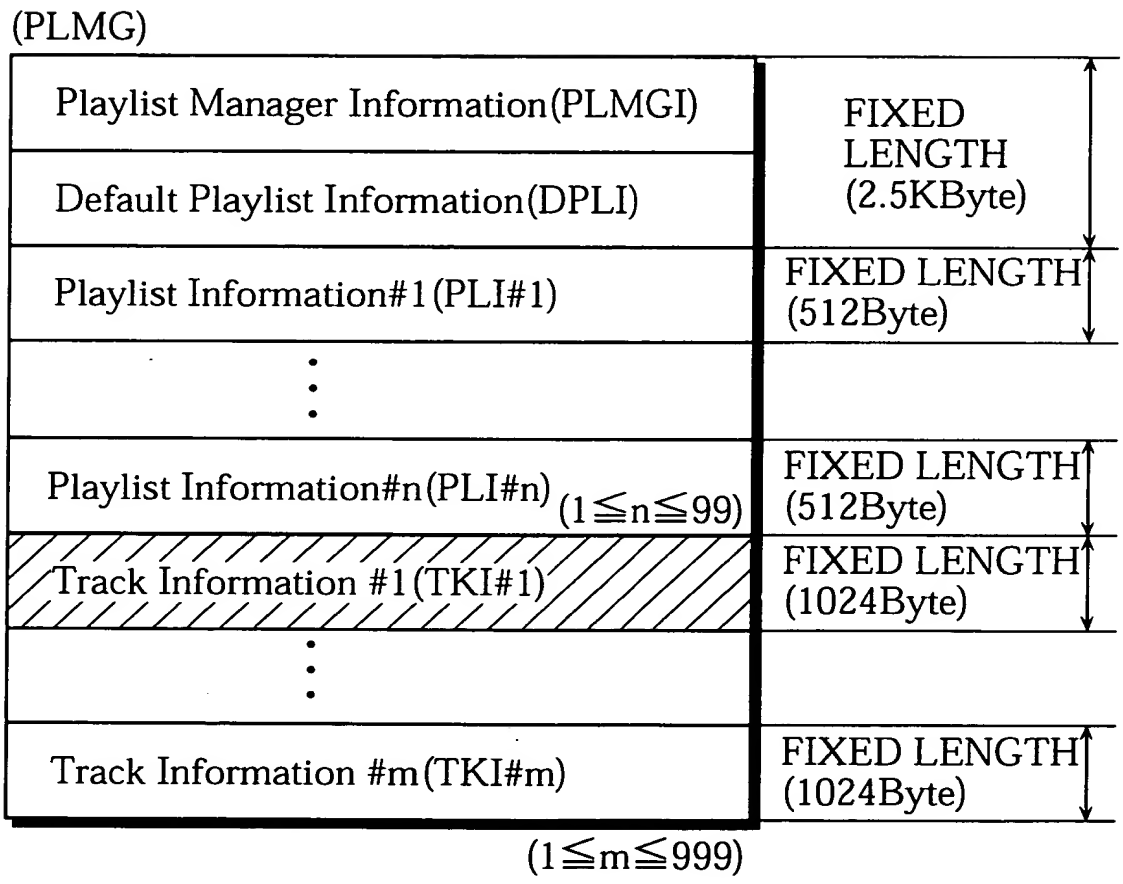

(PLMG)
Playlist Manager Information(PLMGI)
Default Playlist Information(DPLI)
FIXED LENGTH (2.5KByte)
Playlist Information#1(PLI#1)
FIXED LENGTH (512Byte)
Playlist Information#n(PLI#n)
(1≦n≦99)
FIXED LENGTH (512Byte)
Track Information #1(TKI#1)
FIXED LENGTH (1024Byte)
Track Information #m(TKI#m)
FIXED LENGTH (1024Byte)
(1≦m≦999)

FIG. 19

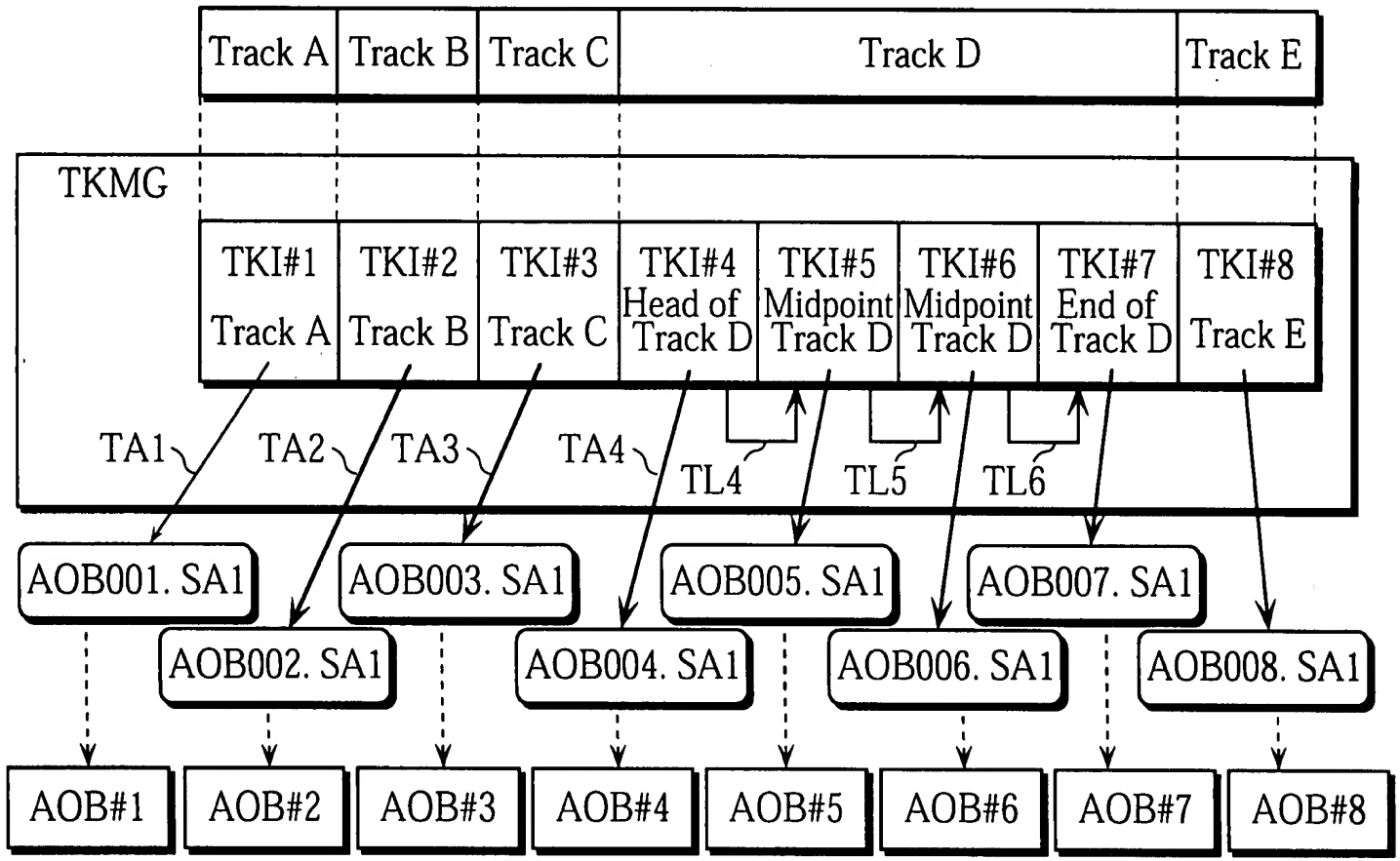
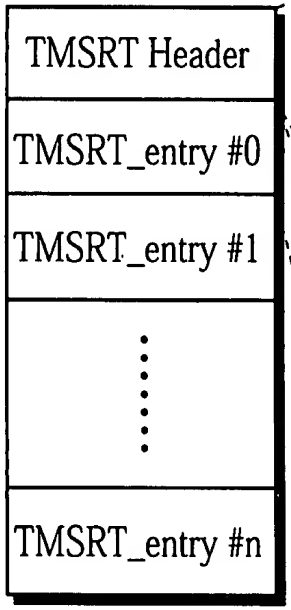

Track A
Track B
Track C
Track D
Track E
TKMG
TKI#1
Track A
TKI#2
Track B
TKI#3
Track C
TKI#4
Head of
Track D
TKI#5
Midpoint
Track D
TKI#6
Midpoint
Track D
TKI#7
End of
Track D
TKI#8
Track E
TA1
TA2
TA3
TA4
TL4
TL5
TL6
AOB001. SA1
AOB003. SA1
AOB005. SA1
AOB007. SA1
AOB002. SA1
AOB004. SA1
AOB006. SA1
AOB008. SA1
AOB#1
AOB#2
AOB#3
AOB#4
AOB#5
AOB#6
AOB#7
AOB#8

FIG. 20



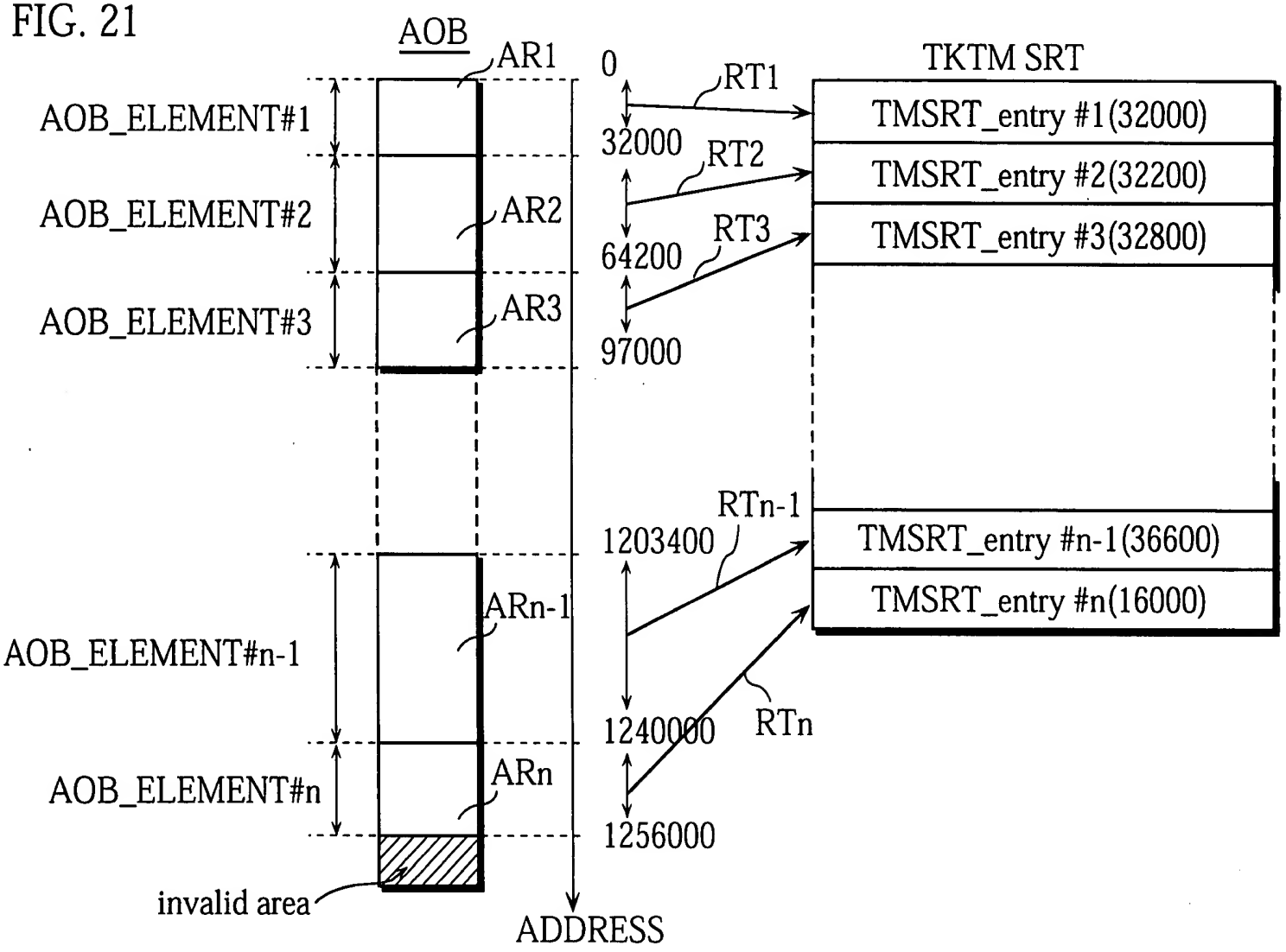
(DESCRIPTION ORDER)

RELATIVE BYTE POSITION	FIELD NAME	CONTENT	NUMBER OF BYTES
0 to 1	TMSRT ID	IDENTIFIER OF TMSRT	2 BYTES
2 to 3	reserved	RESERVED	2 BYTES
4 to 7	Total TMSRT_entry Number	TOTAL NUMBER OF TMSRT_entries	4 BYTES
TOTAL			8 BYTES

(DESCRIPTION ORDER)

RELATIVE BYTE POSITION	FIELD NAME	CONTENT	NUMBER OF BYTES
0 to 3	TMSRT_ENT	Size of AOB_ELEMENT	2 Byte ×252
TOTAL			TOTAL 504 BYTES

FIG. 21


AOB
AR1
AR2
AR3
ARn-1
ARn
AOB_ELEMENT#1
AOB_ELEMENT#2
AOB_ELEMENT#3
AOB_ELEMENT#n-1
AOB_ELEMENT#n
invalid area
0
32000
64200
97000
1203400
1240000
1256000
RT1
RT2
RT3
RTn-1
RTn
TKTM SRT
TMSRT_entry #1(32000)
TMSRT_entry #2(32200)
TMSRT_entry #3(32800)
TMSRT_entry #n-1(36600)
TMSRT_entry #n(16000)
ADDRESS

0958050-052500

FIG. 22

TKI_ID	TKI IDENTIFIER(=A4)
TKIN	TKI NUMBER
reserved	RESERVED
TKI_SZ	TKI SIZE
TKI_LNK_PTR	LINK POINTER TO NEXT TKI
TKI_BLK_ATR	BLOCK ATTRIBUTES OF TKI
TKI_PB_TM	PLAYBACK PERIOD
TKI_AOB_ATR	AUDIO ATTRIBUTES OF TKI
ISRC	ISRC
BIT	BLOCK INFORMATION TABLE

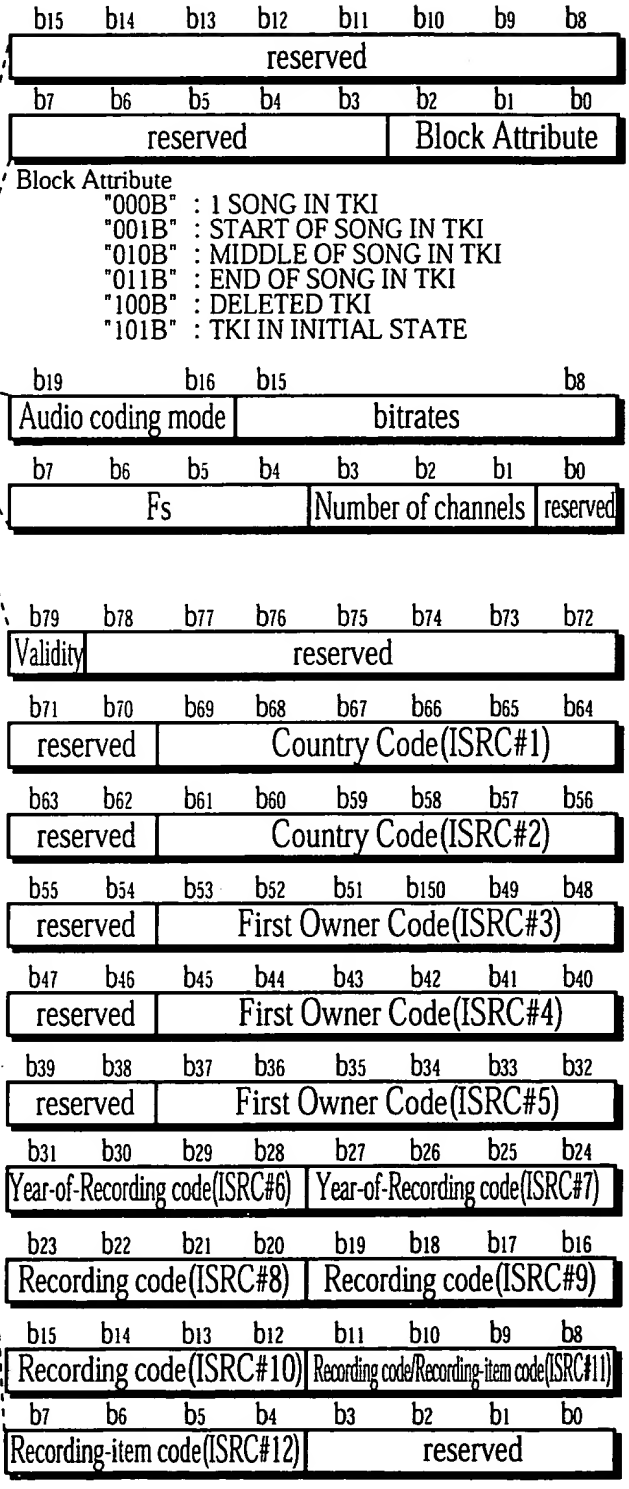


FIG. 23A

RELATIVE BYTE POSITION	FIELD NAME	CONTENT	NUMBER OF BYTES
60 to 63	DATA_OFFSET	FIRST ADDRESS OF AOB_BLOCK	4 BYTES
64 to 67	SZ_DATA	DATA LENGTH OF AOB_BLOCK	4 BYTES
68 to 71	TMSRTE_Ns	NUMBER OF TMSRT_entries	4 BYTES
72 to 73	FNs_1st_TMSRTE	NUMBER OF AOB_FRAMEs IN FIRST AOB_ELEMENT	2 BYTES
74 to 75	FNs_Last_TMSRTE	NUMBER OF AOB_FRAMEs IN LAST AOB_ELEMENT	2 BYTES
76 to 77	FNs_Middle_TMSRTE	NUMBER OF AOB_FRAMEs IN AOB_ELEMENTS	2 BYTES
78 to 79	TIME_LENGTH	PLAYBACK PERIOD OF AOB_ELEMENTS	2 BYTES
		TOTAL	20 BYTES

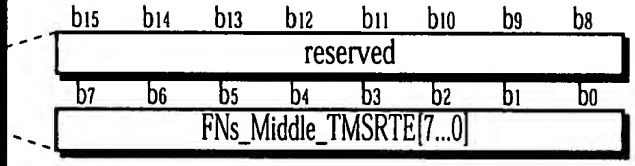


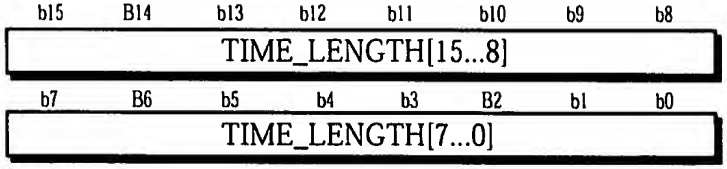
FIG. 23B

sampling frequency	FNs_Middle_TMSRTE		
	AAC	MPEGlayer3	WMA
48kHz	47*N	42*N	×××
44.1kHz	43*N	38*N	×××
32kHz	32*N	28*N	×××
24kHz	24*N	42*N	×××
22.05kHz	22*N	38*N	×××
16kHz	16*N	28*N	×××

※ N BEING THE PLAYBACK PERIOD "TIME_LENGTH" OF AN AOB_ELEMENT TO AN ACCURACY OF 1/1000TH OF ONE SECOND

FIG. 23C

TIME_LENGTH



TIME_LENGTH=2000 FOR AAC.MP3

FIG. 24

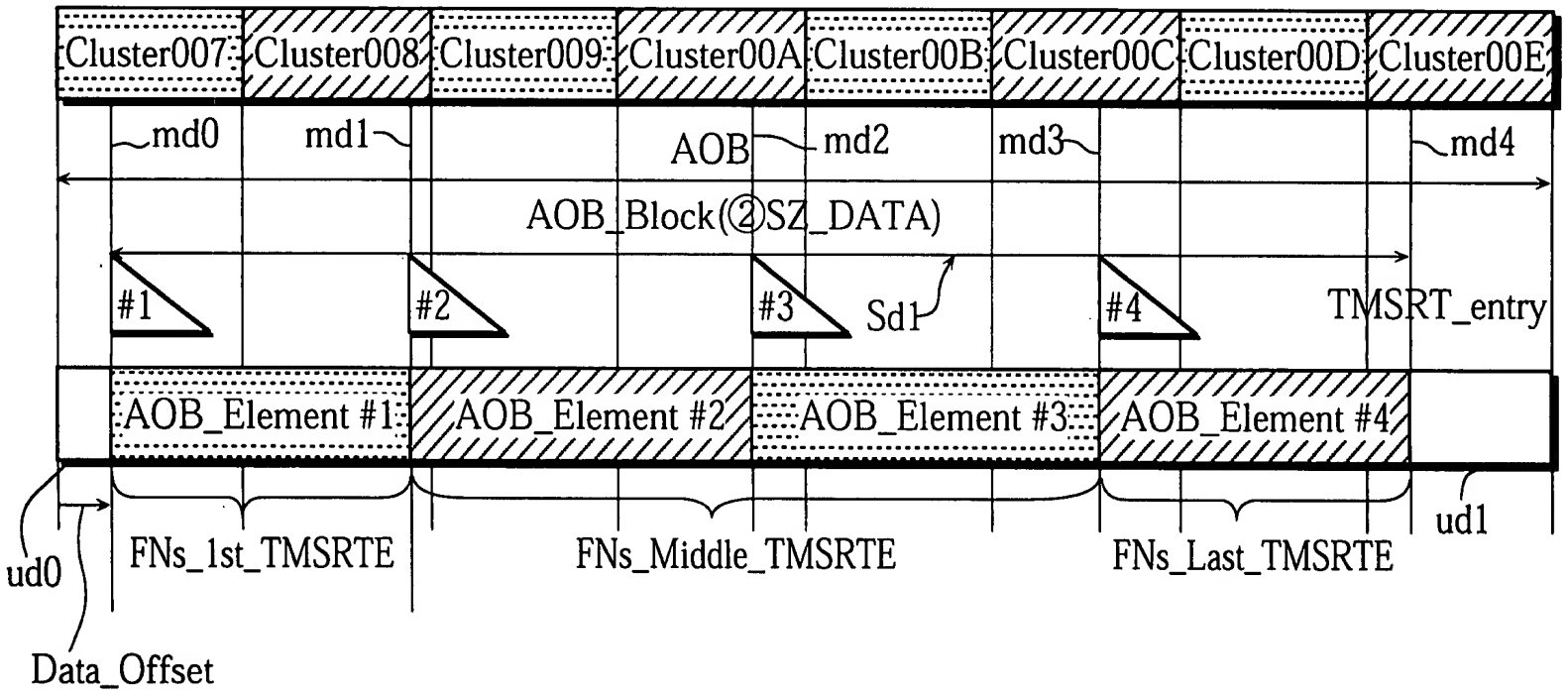

Cluster007
Cluster008
Cluster009
Cluster00A
Cluster00B
Cluster00C
Cluster00D
Cluster00E
md0
md1
AOB
md2
md3
md4
AOB_Block(②SZ_DATA)
#1
#2
#3
Sd1
#4
TMSRT_entry
AOB_Element #1
AOB_Element #2
AOB_Element #3
AOB_Element #4
ud1
ud0
FNs_1st_TMSRTE
FNs_Middle_TMSRTE
FNs_Last_TMSRTE
Data_Offset

FIG. 25

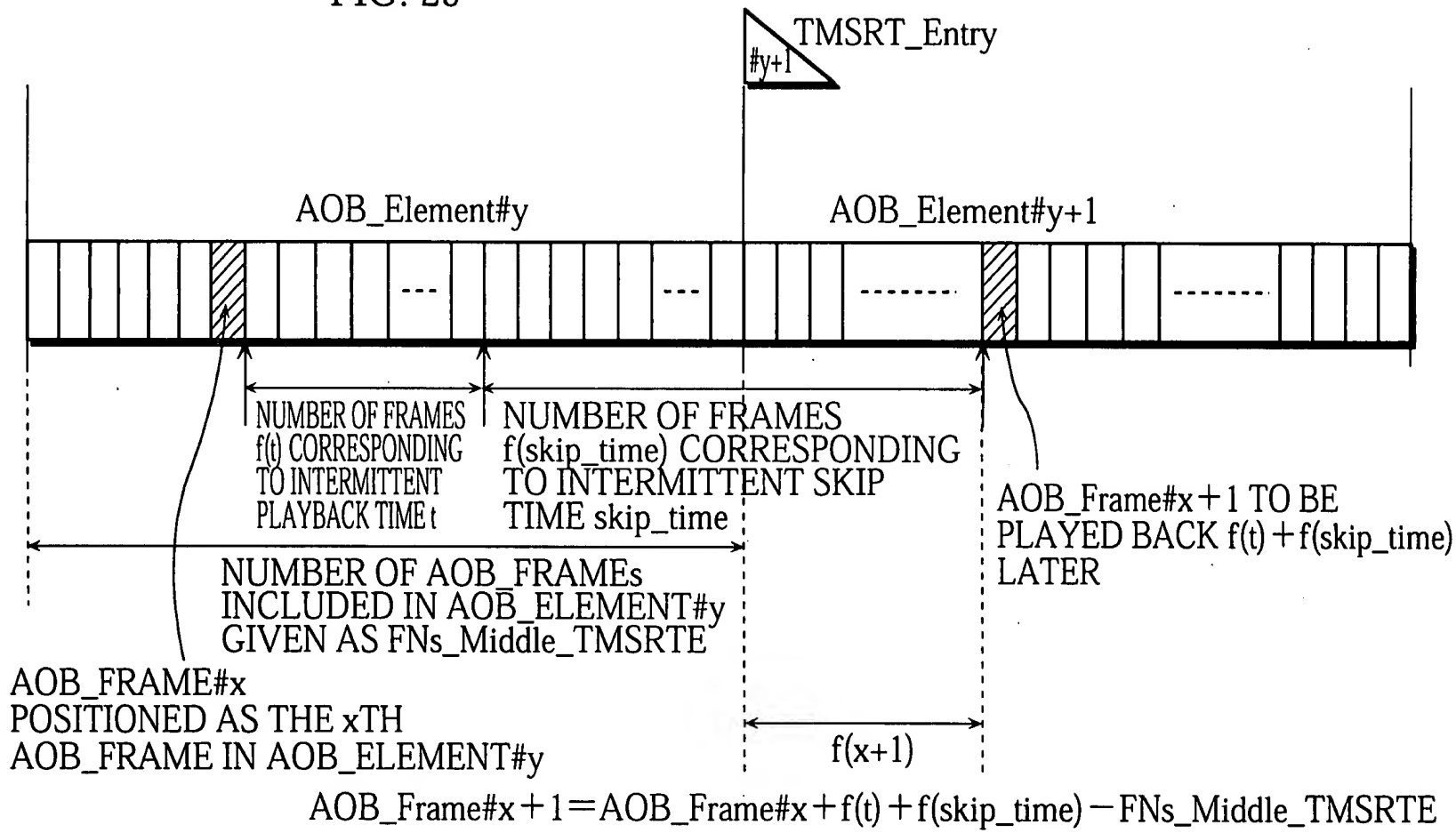
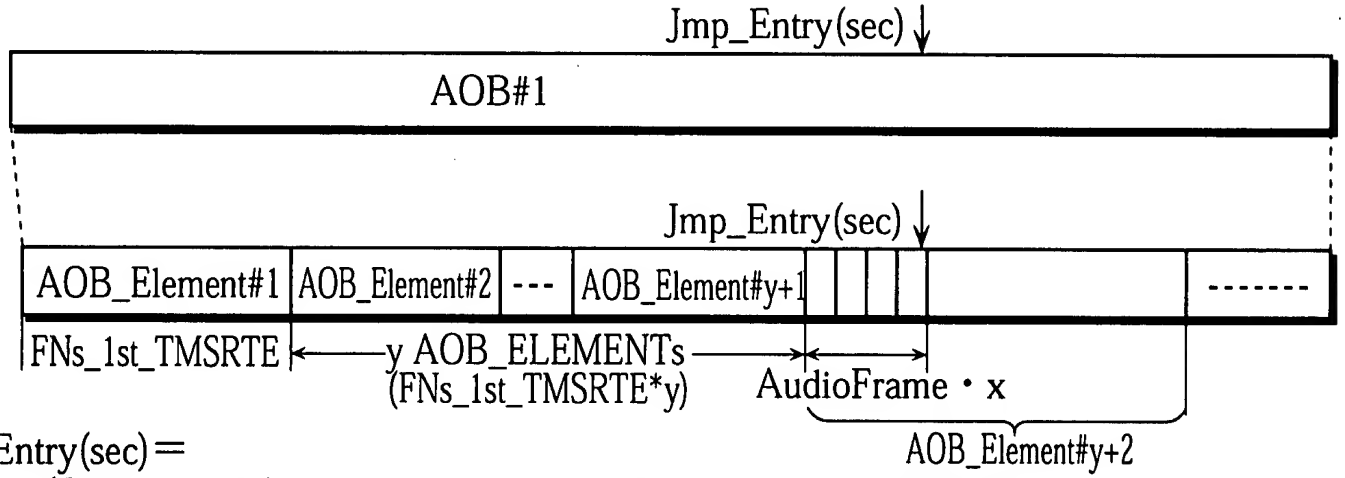
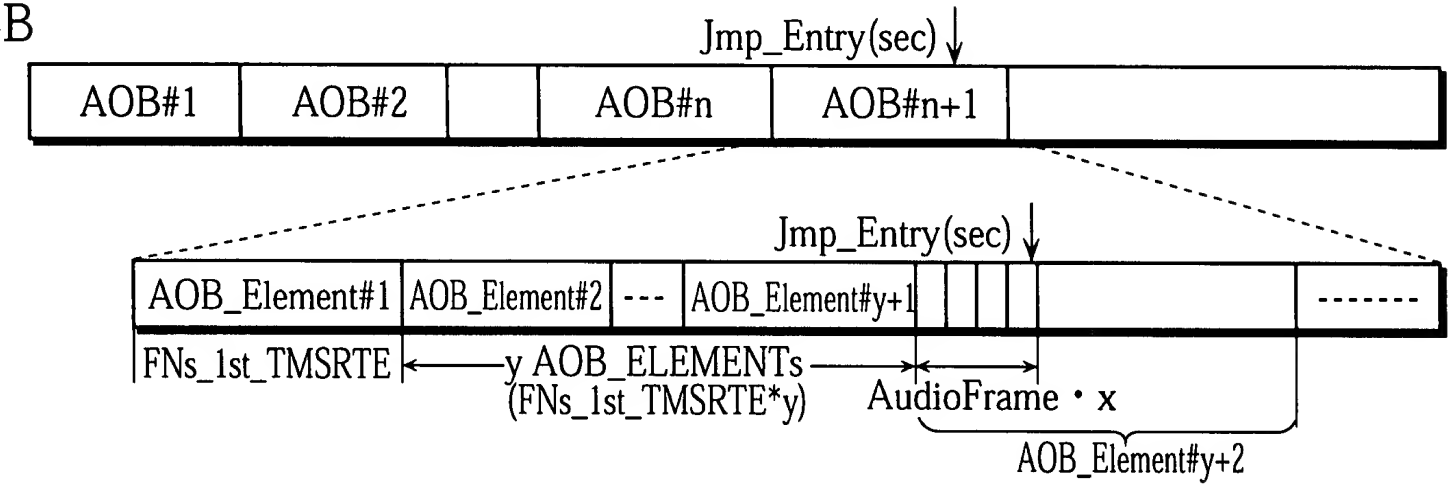

TMSRT_Entry
#y+1
AOB_Element#y
AOB_Element#y+1
NUMBER OF FRAMES f(t) CORRESPONDING TO INTERMITTENT PLAYBACK TIME t
NUMBER OF FRAMES f(skip_time) CORRESPONDING TO INTERMITTENT SKIP TIME skip_time
AOB_Frame#x+1 TO BE PLAYED BACK f(t)+f(skip_time) LATER
NUMBER OF AOB_FRAMEs INCLUDED IN AOB_ELEMENT#y GIVEN AS FNs_Middle_TMSRTE
AOB_FRAME#x POSITIONED AS THE xTH AOB_FRAME IN AOB_ELEMENT#y
f(x+1)
AOB_Frame#x+1=AOB_Frame#x+f(t)+f(skip_time)−FNs_Middle_TMSRTE

FIG. 26A



Jmp_Entry(sec)=
(FNs_1st_TMSRTE+FNs_middle_TMSRTE・y+x)×20msec

FIG. 26B



Jmp_Entry(sec)=TOTAL PLAYBACK PERIOD FROM AOB#1 TO AOB#n+
FNs_1st_TMSRTE(#n+1)+FNs_Middle_TMSRTE(#n+1)*y+x)*20msec

FIG. 27A

DELETION OF Track B(case 1)

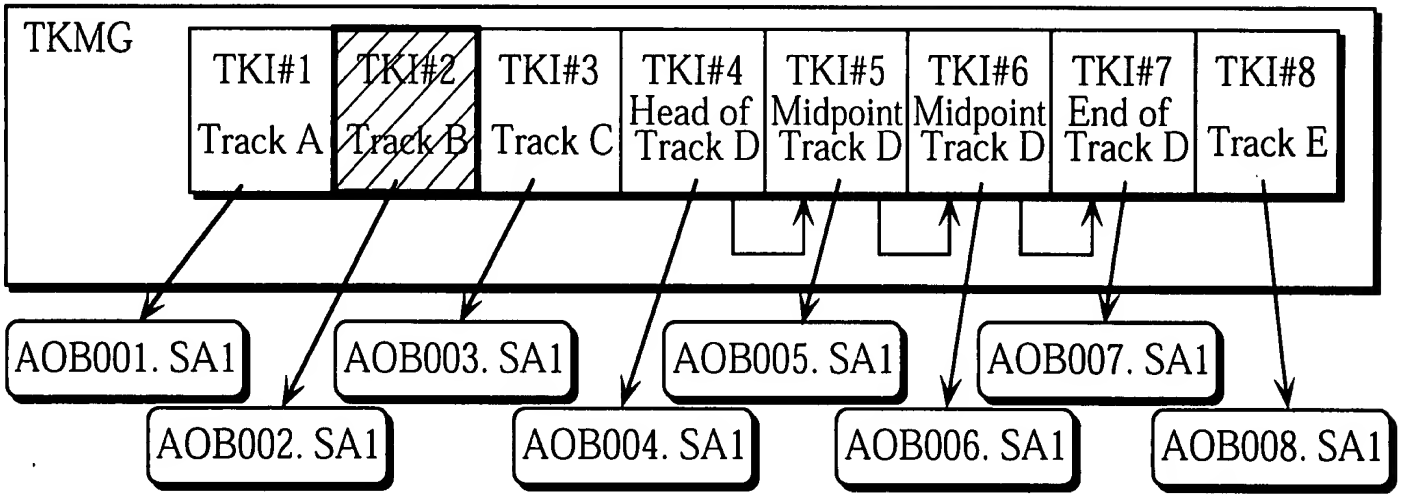


FIG. 27B

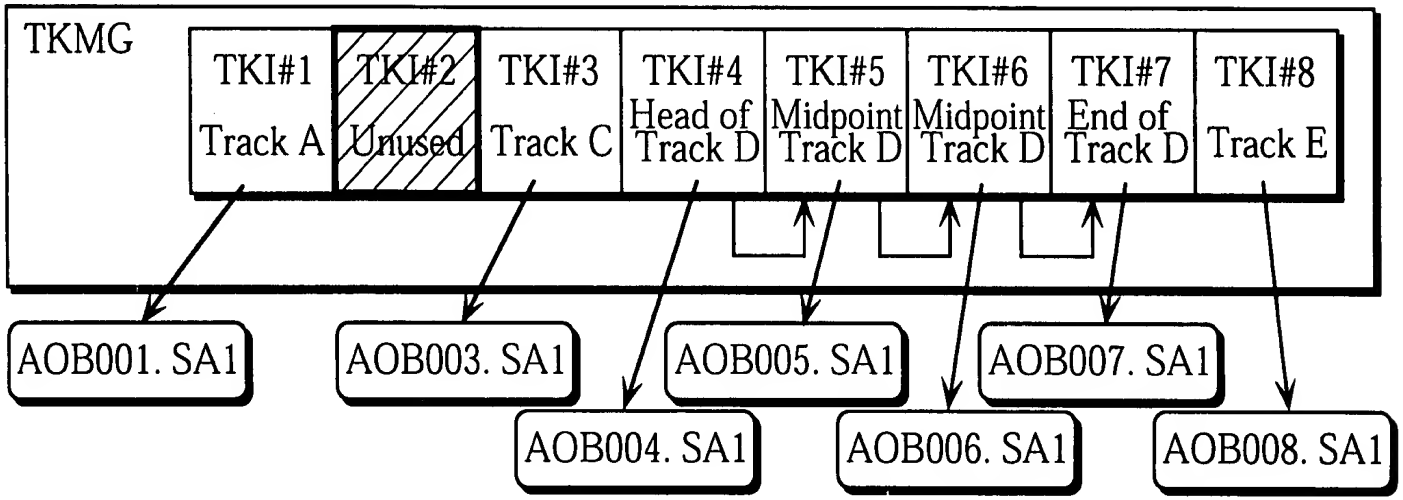


FIG. 28A UPDATING TrackManager USING UNUSED TKI AT DIFFERENT POSITIONS(case 2)

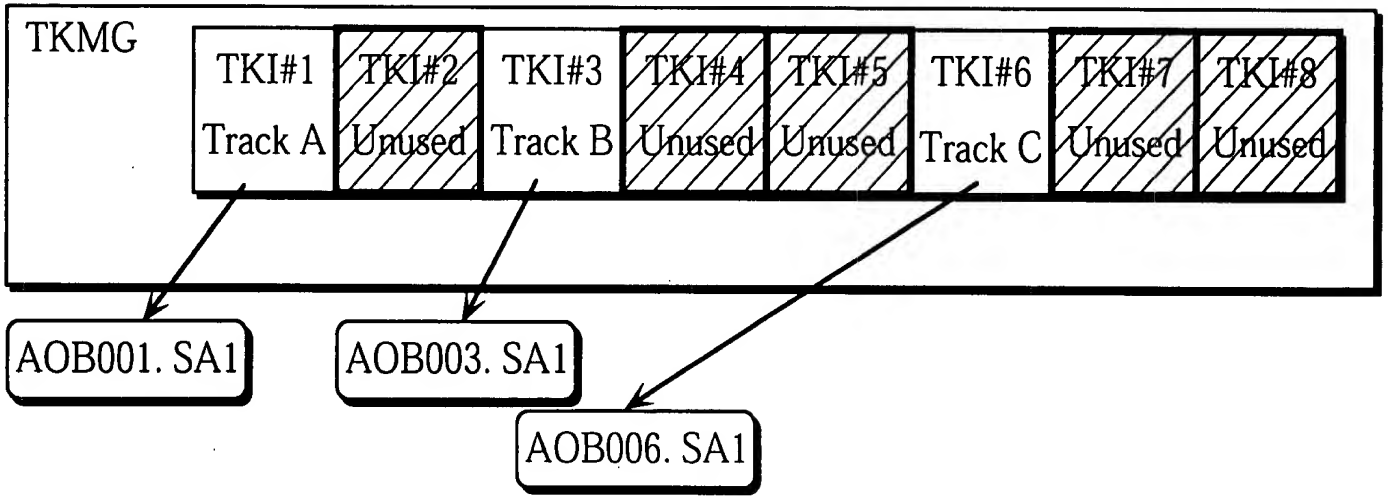


FIG. 28B

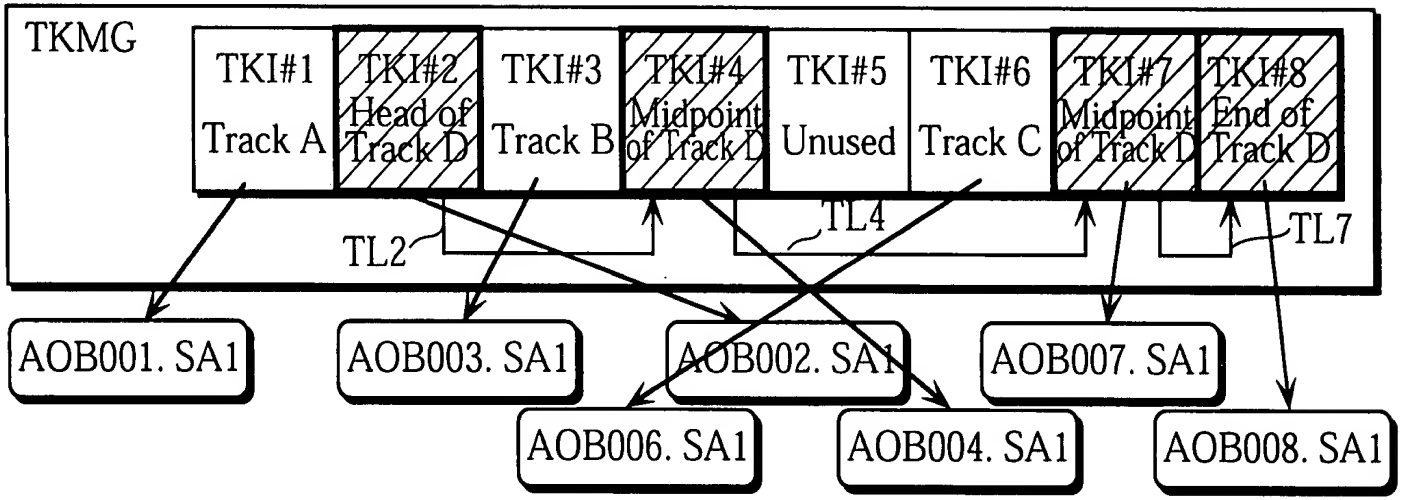


FIG. 29A

COMBINING OF Track C AND Track E TO PRODUCE NEW Track C(case 3)

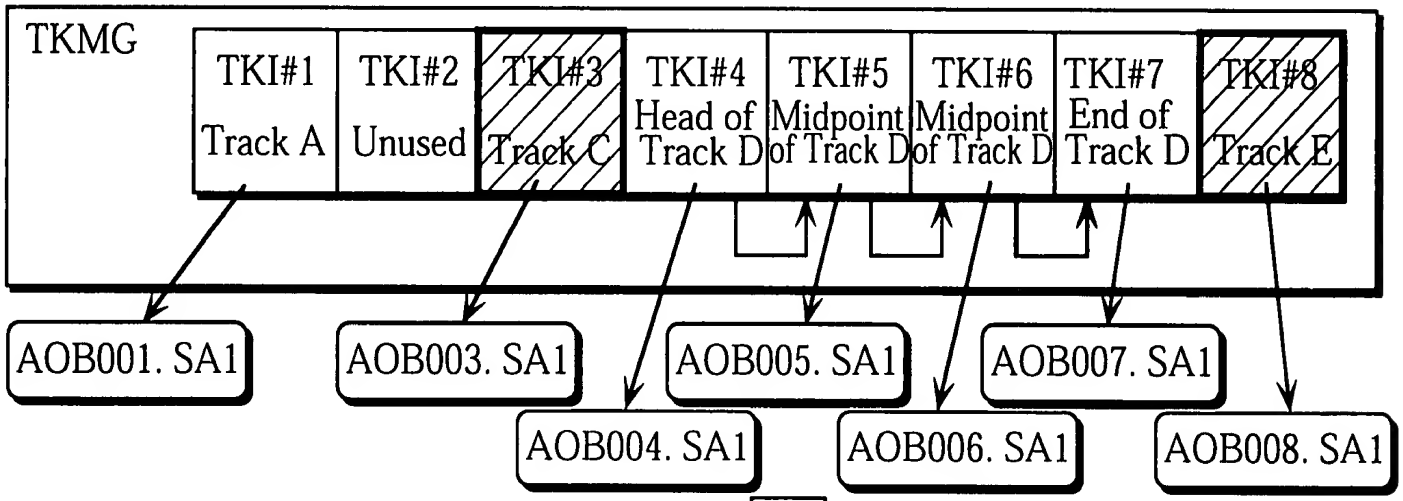


FIG. 29B

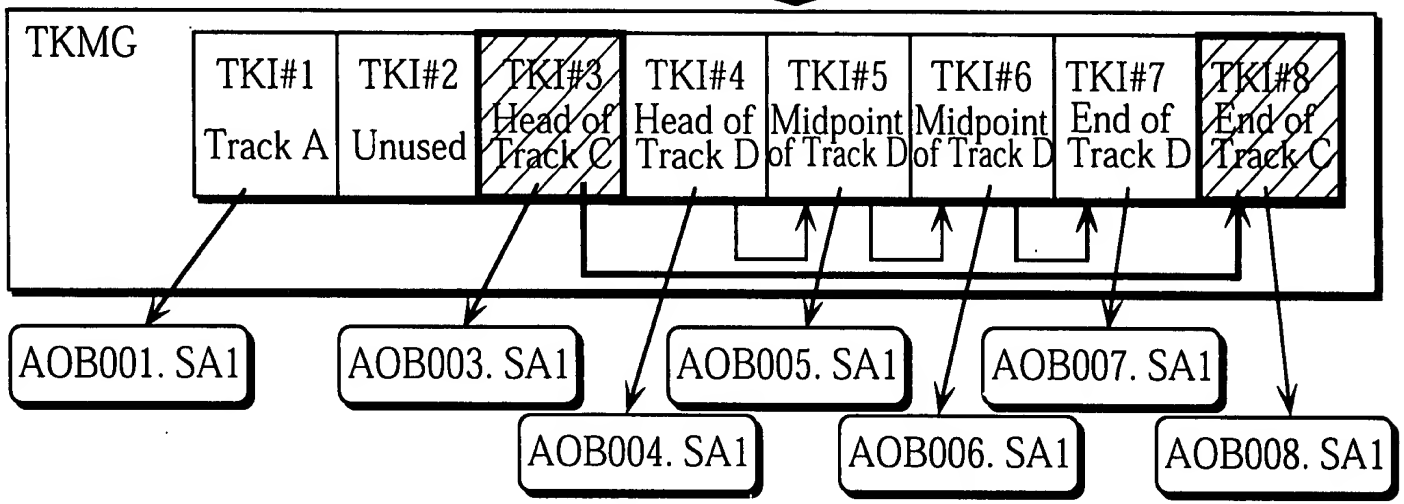


FIG. 30A

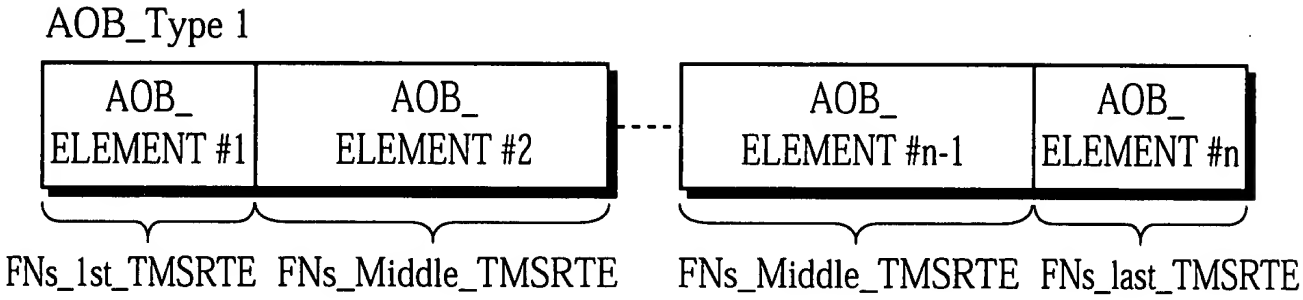


FIG. 30B

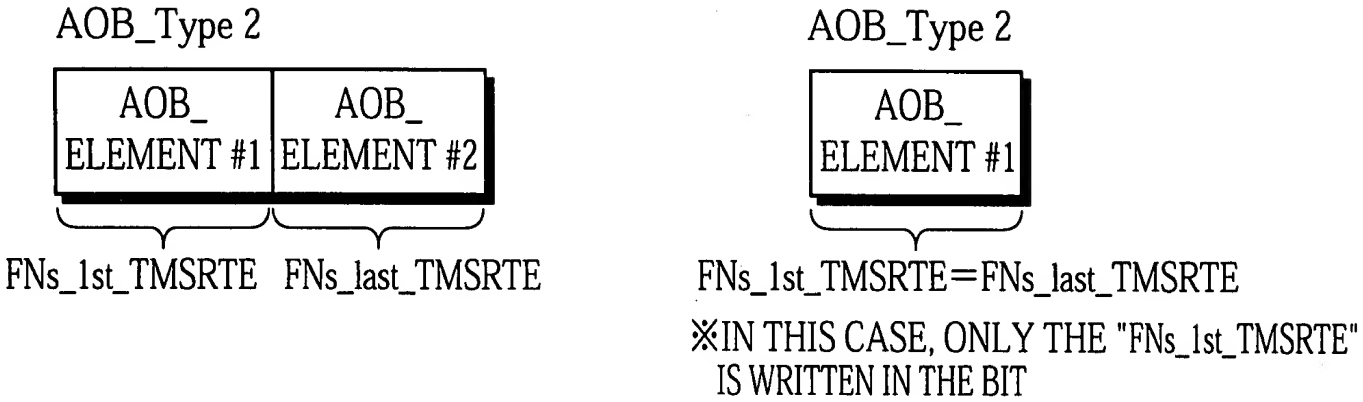


FIG. 31A

PATTERN WHERE COMBINING OF AOBs POSSIBLE

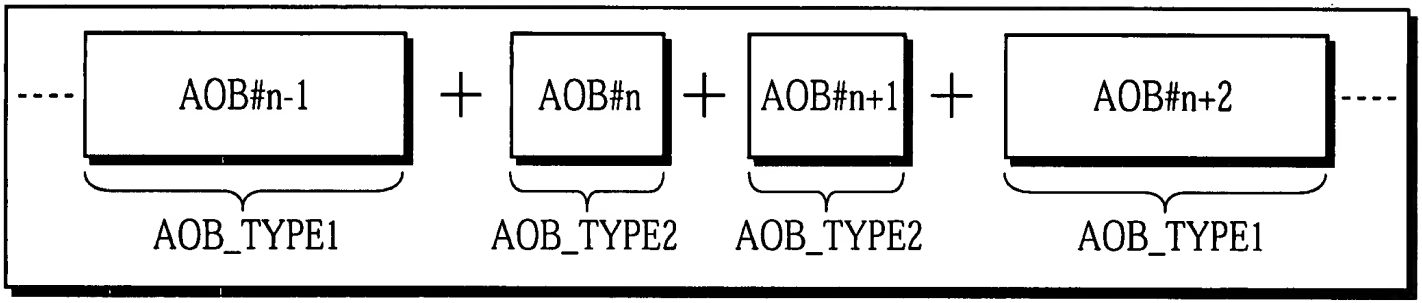


FIG. 31B

PATTERN WHERE COMBINING OF AOBs NOT POSSIBLE

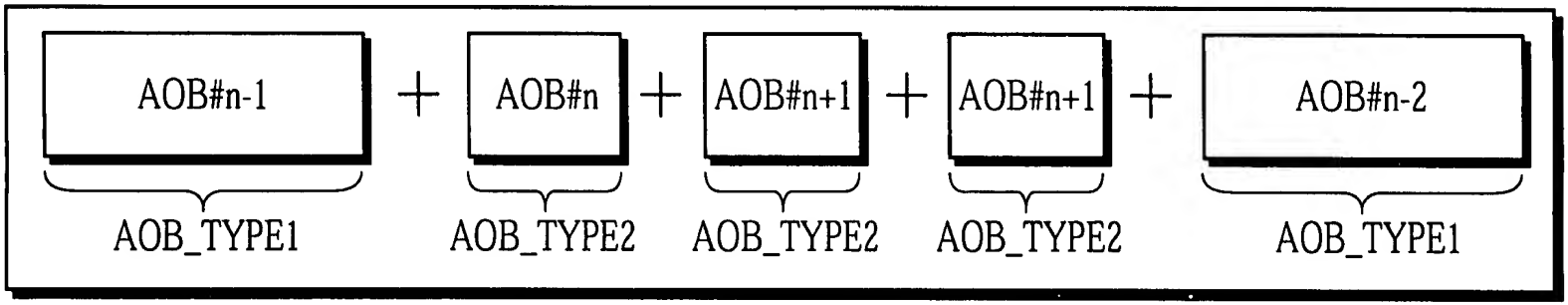


FIG. 32A

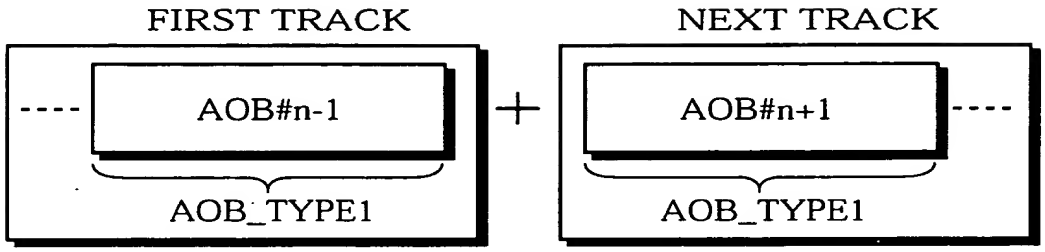


FIG. 32B

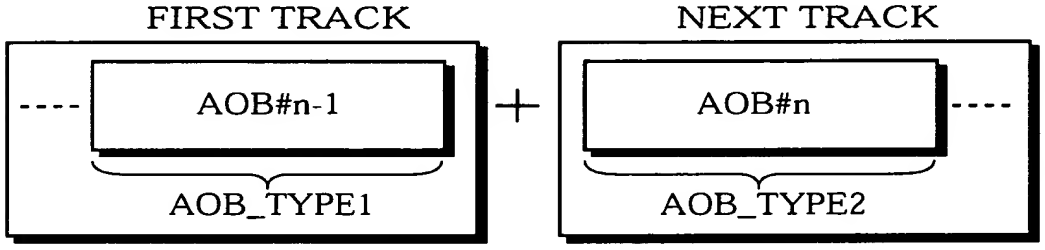


FIG. 32C

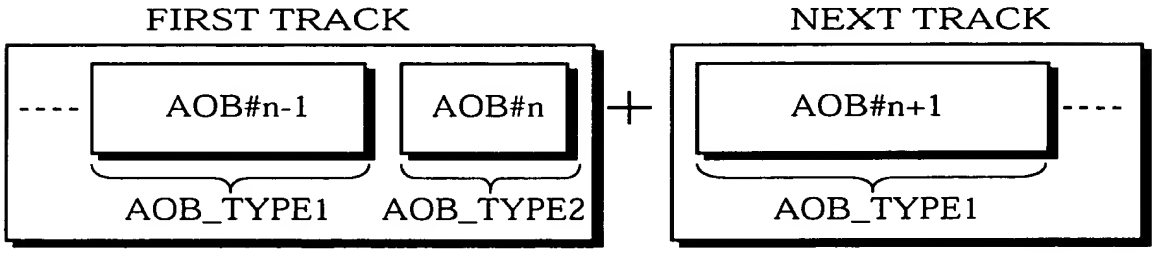


FIG. 32D

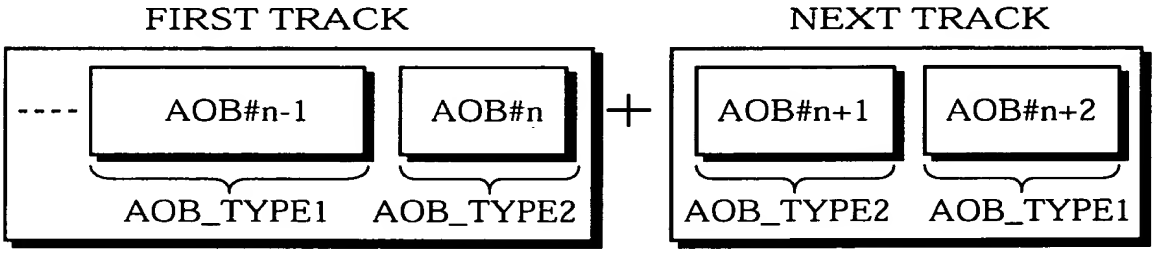
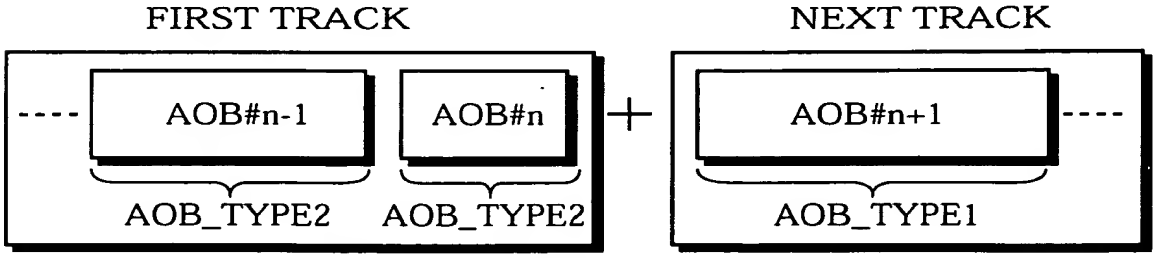


FIG. 32E



0956080-1-050208

FIG. 33A

DIVISION OF Track C INTO Track C AND Track F(case 4)

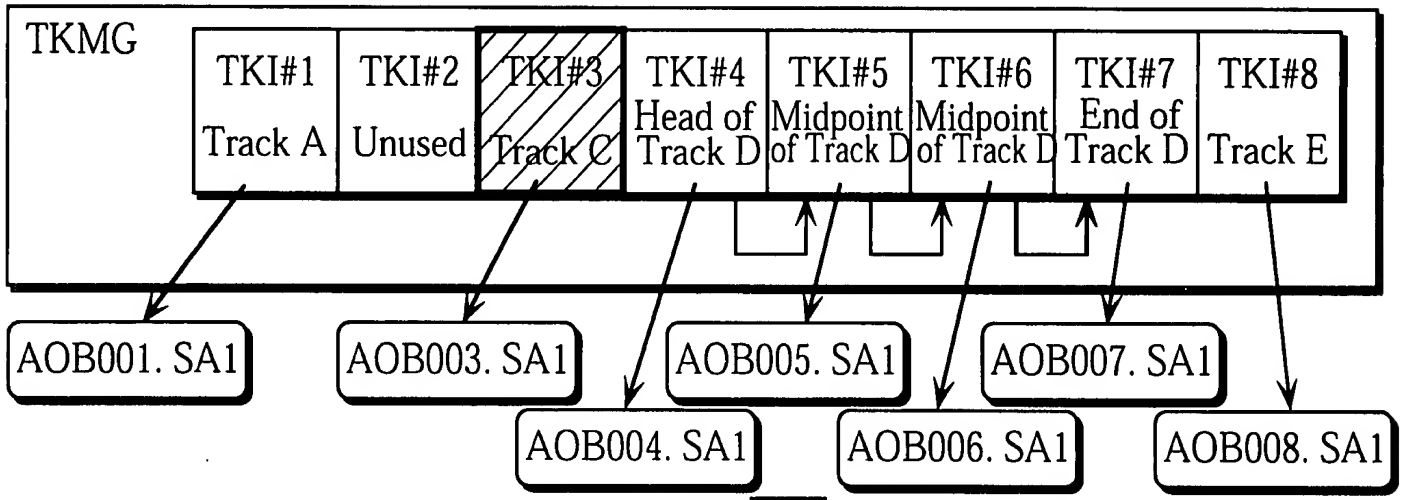


FIG. 33B

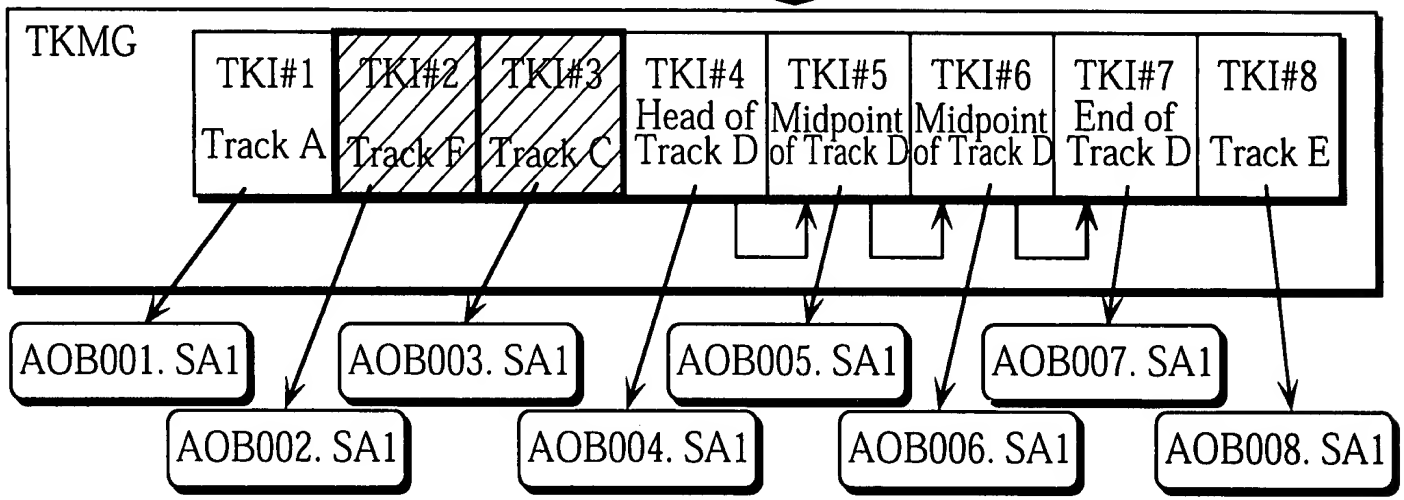


FIG. 34A

SD-Audio DIRECTORY ENTRY

FILE NAME	FILE NAME EXTENSION	FIRST CLUSTER NUMBER IN FILE
AOB003	SA 1	007

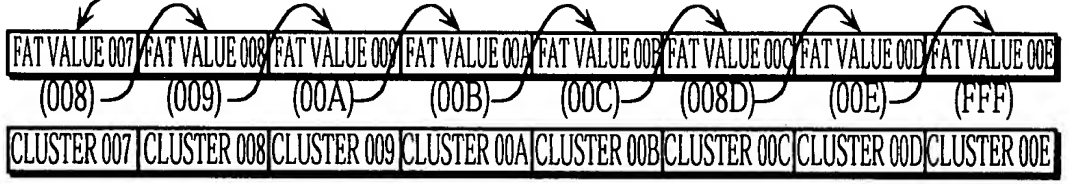


FIG. 34B

SD-Audio DIRECTORY ENTRIES

FILE NAME	FILE NAME EXTENSION	FIRST CLUSTER NUMBER IN FILE
AOB002	SA 1	00F
FILE NAME	FILE NAME EXTENSION	FIRST CLUSTER NUMBER IN FILE
AOB003	SA 1	007

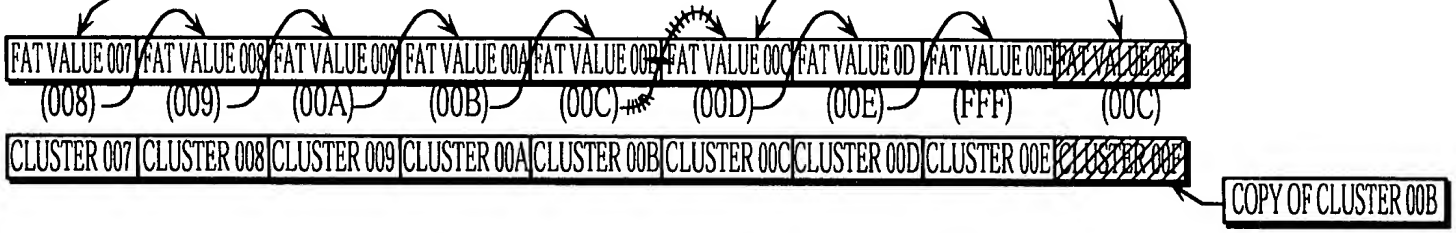


FIG. 35A

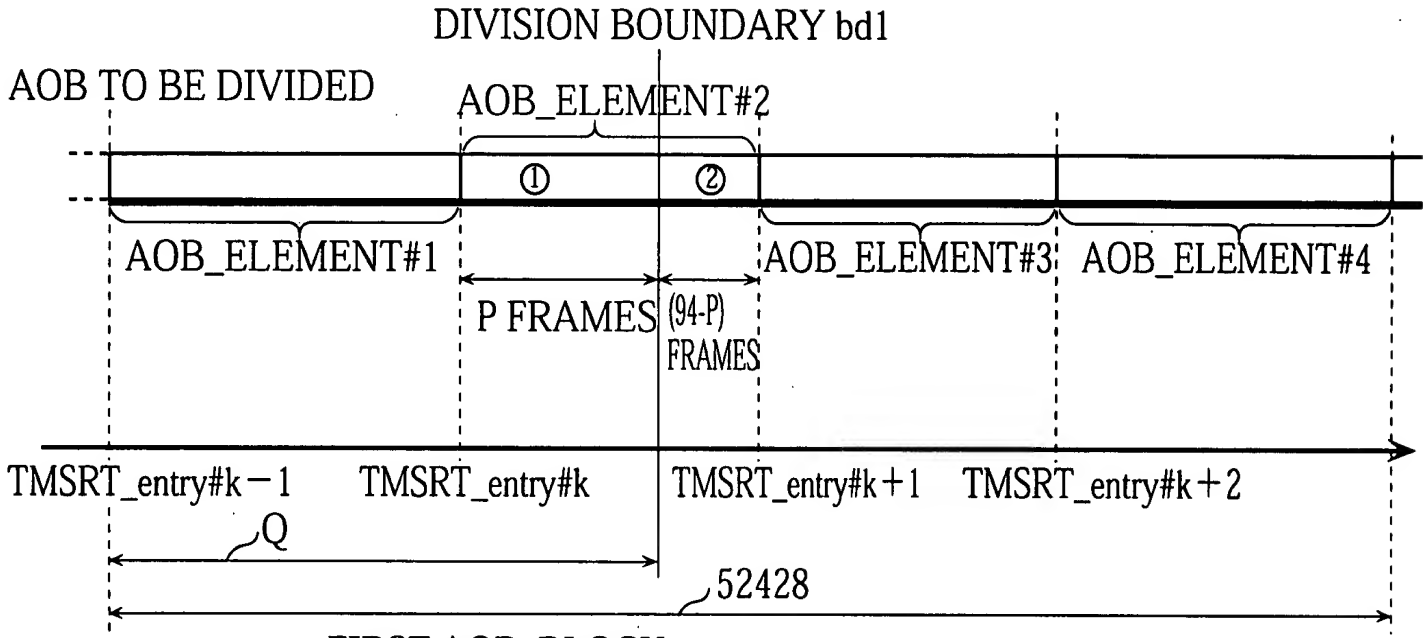


FIG. 35B

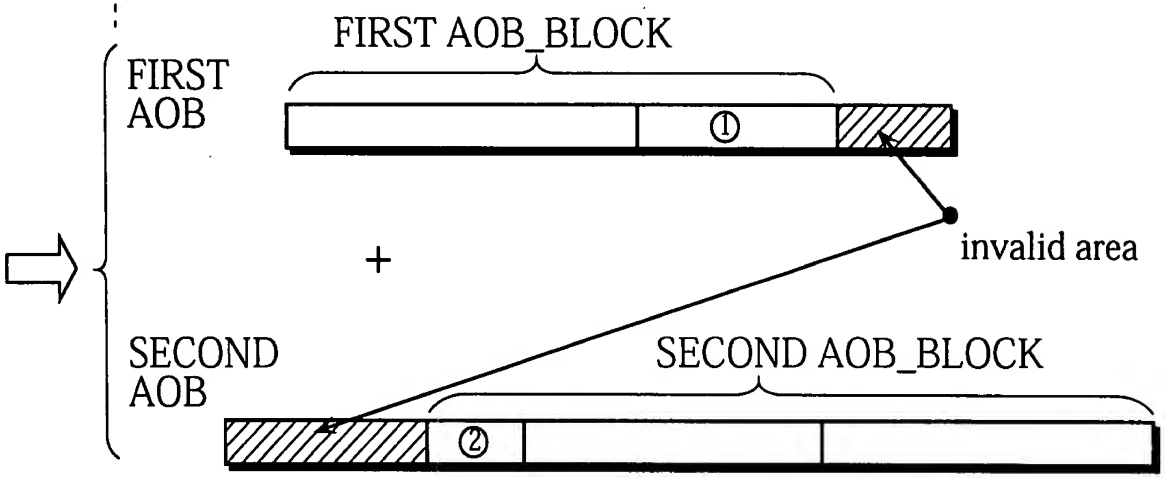


FIG. 36

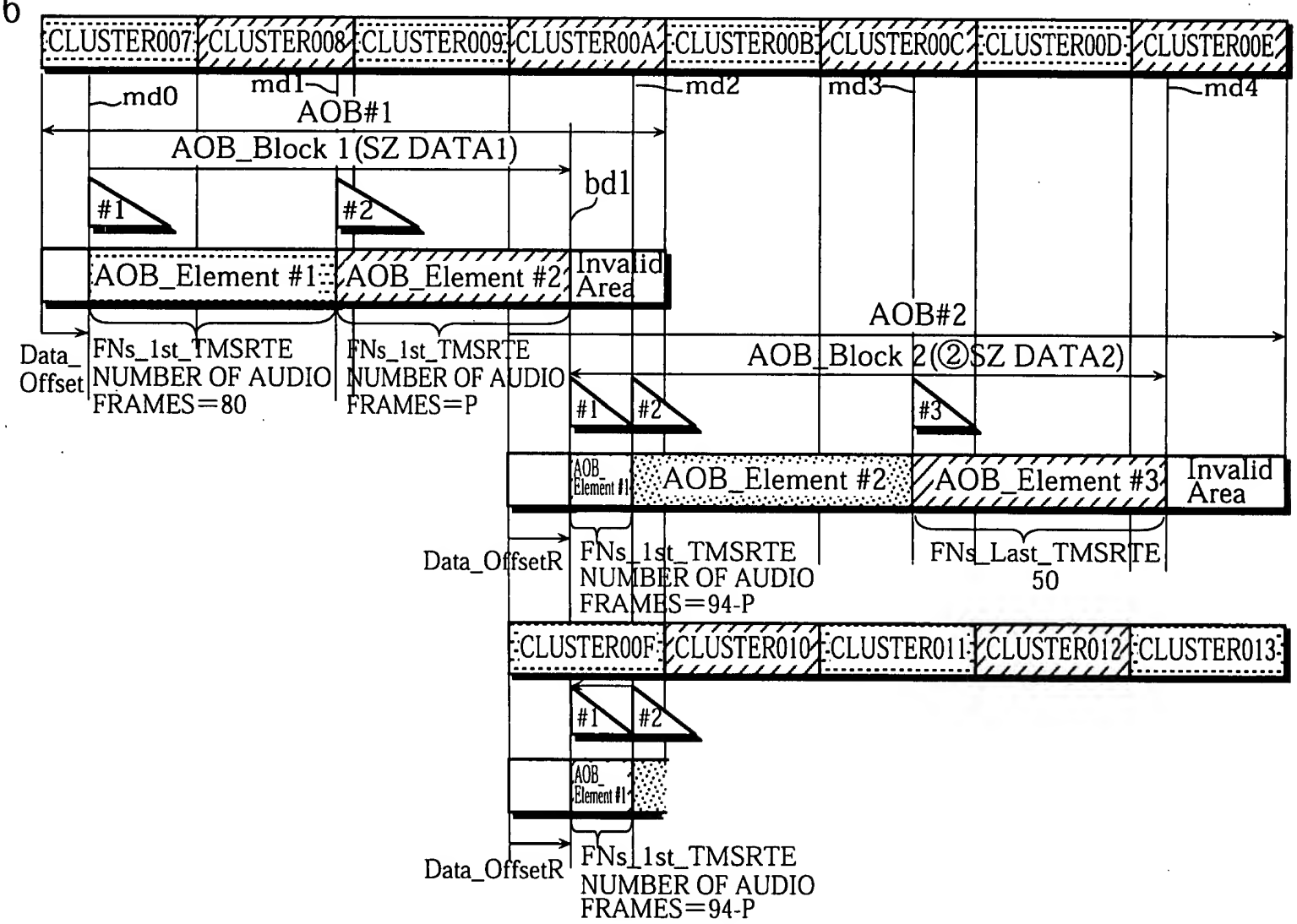

CLUSTER007
CLUSTER008
CLUSTER009
CLUSTER00A
CLUSTER00B
CLUSTER00C
CLUSTER00D
CLUSTER00E
md0
md1
AOB#1
md2
md3
md4
AOB_Block 1(SZ DATA1)
bd1
#1
#2
AOB_Element #1
AOB_Element #2
Invalid Area
AOB#2
Data_ Offset
FNs_1st_TMSRTE NUMBER OF AUDIO FRAMES=80
FNs_1st_TMSRTE NUMBER OF AUDIO FRAMES=P
AOB_Block 2(②SZ DATA2)
#3
AOB_ Element #1
AOB_Element #3
Invalid Area
Data_OffsetR
FNs_1st_TMSRTE NUMBER OF AUDIO FRAMES=94-P
FNs_Last_TMSRTE 50
CLUSTER00F
CLUSTER010
CLUSTER011
CLUSTER012
CLUSTER013
Data_OffsetR
FNs_1st_TMSRTE NUMBER OF AUDIO FRAMES=94-P

FIG. 37

ORIGINAL BIT

Data_Offset	x
SZ_DATA	52428
TMSRTE_Ns	n
FNs_1st_TMSRTE	80
FNs_last_TMSRTE	50
FNs_Middle_TMSRTE	94

FIRST BIT

Data_Offset	x
SZ_DATA	Q
TMSRTE_Ns	k
FNs_1st_TMSRTE	80
FNs_last_TMSRTE	P
FNs_Middle_TMSRTE	94

SECOND BIT

Data_Offset	R
SZ_DATA	52428−Q
TMSRTE_Ns	n−k+1
FNs_1st_TMSRTE	94−P
FNs_last_TMSRTE	50
FNs_Middle_TMSRTE	94

FIG. 38

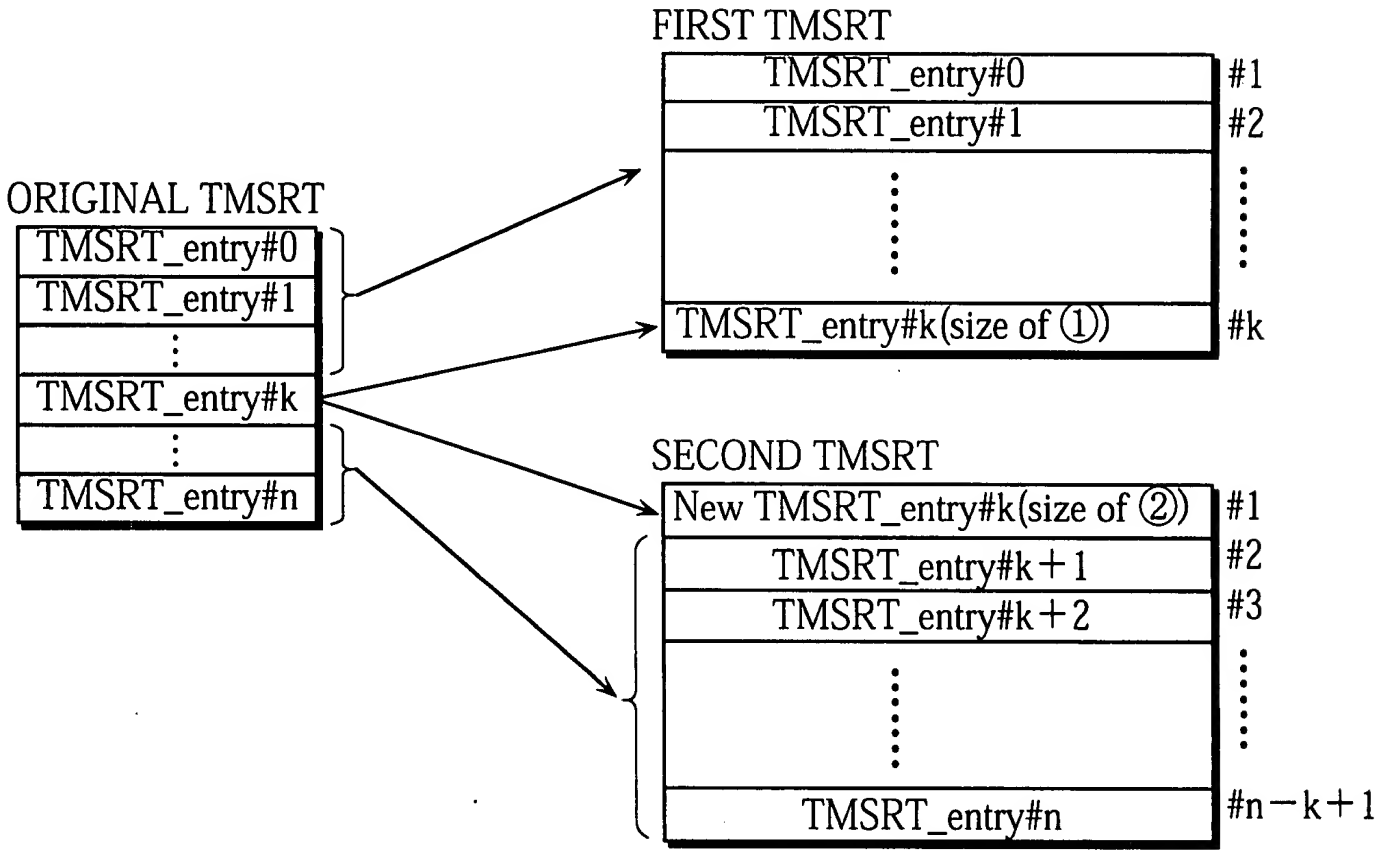

FIRST TMSRT
TMSRT_entry#0
TMSRT_entry#1
TMSRT_entry#k(size of ①)
#1
#2
#k
ORIGINAL TMSRT
TMSRT_entry#0
TMSRT_entry#1
TMSRT_entry#k
TMSRT_entry#n
SECOND TMSRT
New TMSRT_entry#k(size of ②)
TMSRT_entry#k+1
TMSRT_entry#k+2
TMSRT_entry#n
#1
#2
#3
#n−k+1

FIG. 39A

ATTRIBUTES OF DPL_TK_ATR

ATTRIBUTES	CONTENT
000b	ONE SONG PRESENT IN ONE TKI
001b	ONE SONG PRESENT IN A PLURALITY OF TKIs, THIS PART BEING THE START
010b	ONE SONG PRESENT IN A PLURALITY OF TKIs, THIS PART BEING A CENTRAL PART
011b	ONE SONG PRESENT IN A PLURALITY OF TKIs, THIS PART BEING THE END
100b	TKI UNUSED, THOUGH TKI PRESENT. OCCURS WHEN A TKI IS DELETED
101b	TKI UNUSED AND NO TKI PRESENT. INITIAL STATE OF A TKI

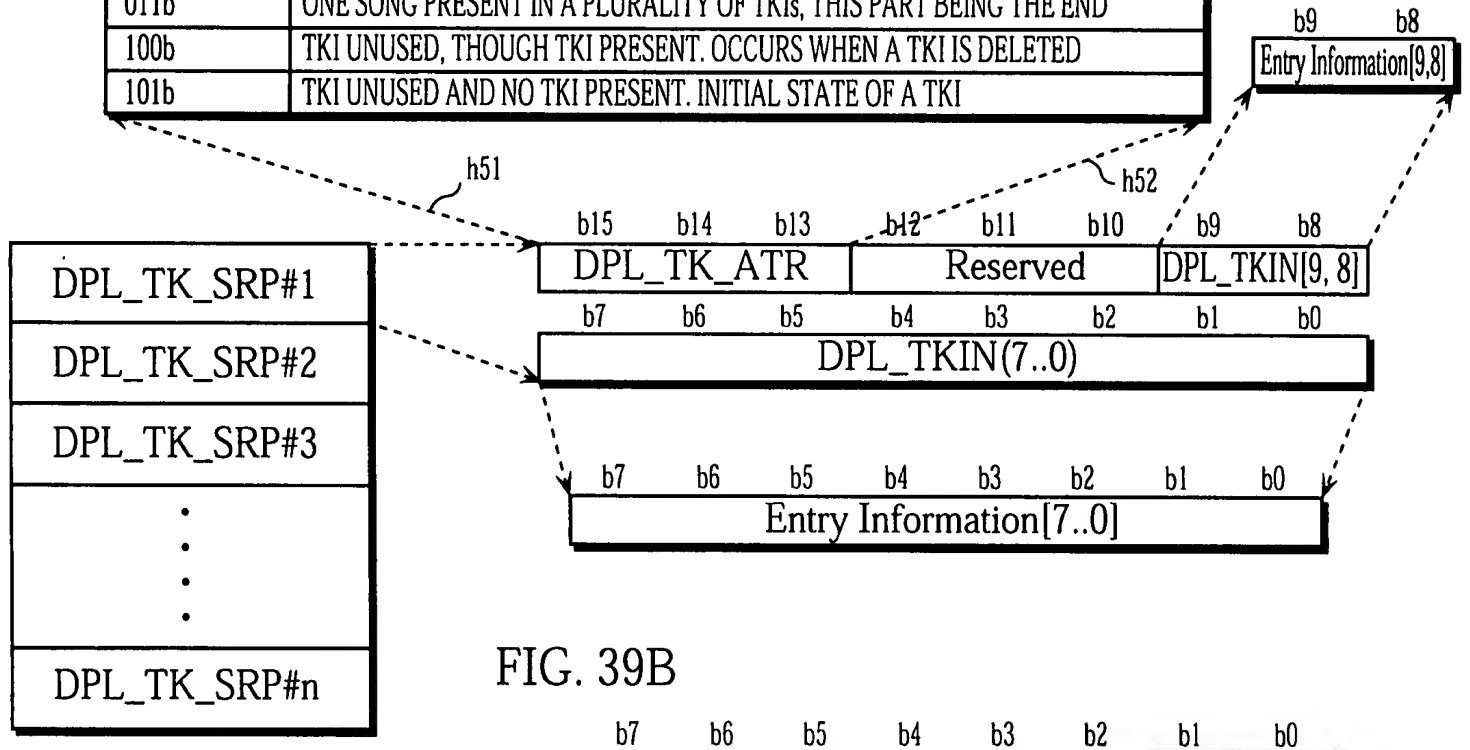


FIG. 39B

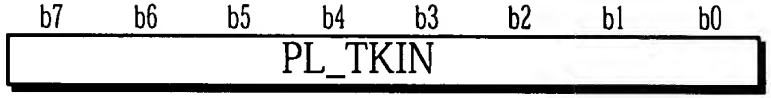


FIG. 40

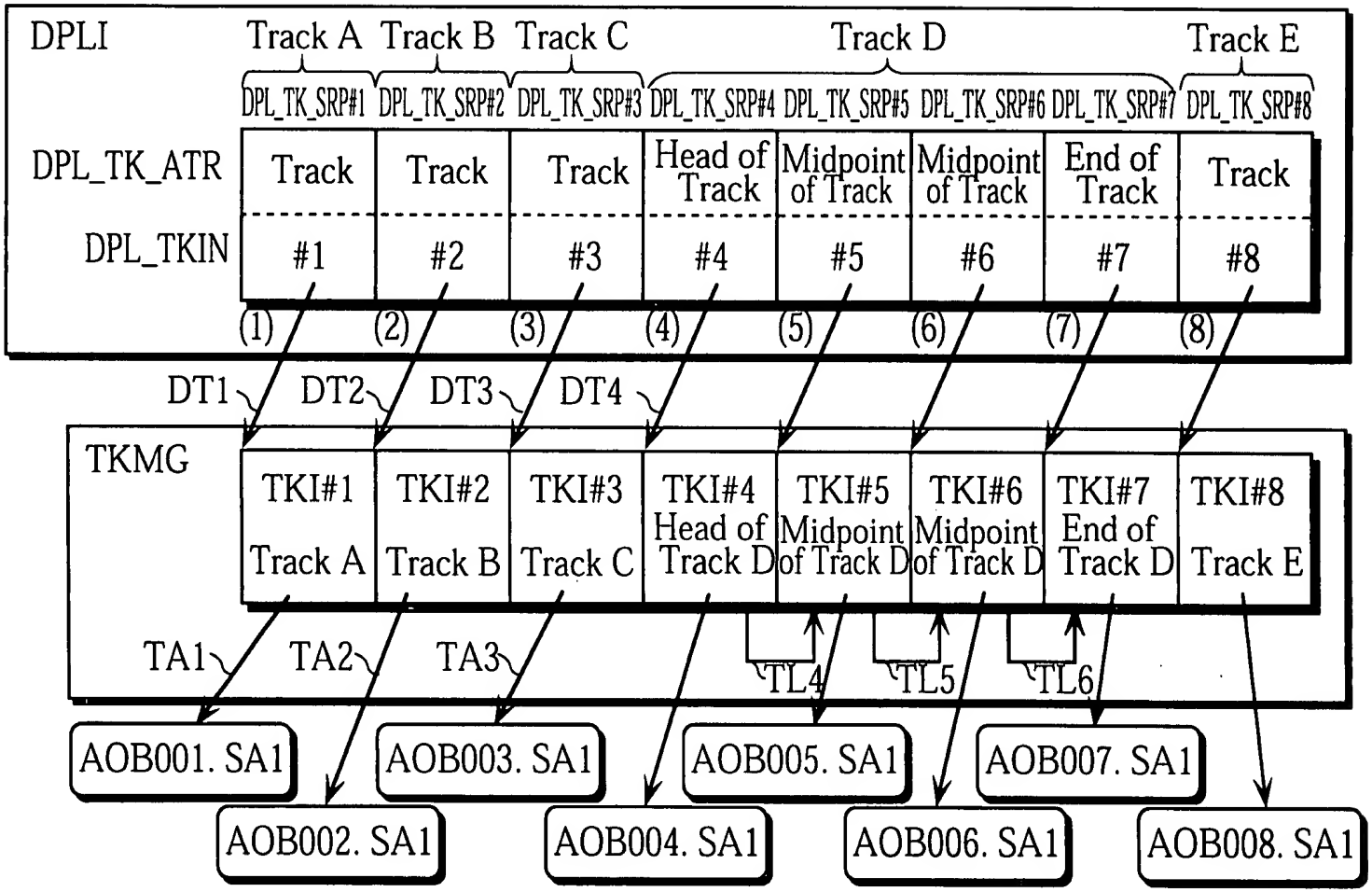

DPLI
Track A
Track B
Track C
Track D
Track E
DPL_TK_SRP#1
DPL_TK_SRP#2
DPL_TK_SRP#3
DPL_TK_SRP#4
DPL_TK_SRP#5
DPL_TK_SRP#6
DPL_TK_SRP#7
DPL_TK_SRP#8
DPL_TK_ATR
Track
Track
Track
Head of Track
Midpoint of Track
Midpoint of Track
End of Track
Track
DPL_TKIN
#1
#2
#3
#4
#5
#6
#7
#8
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
DT1
DT2
DT3
DT4
TKMG
TKI#1 Track A
TKI#2 Track B
TKI#3 Track C
TKI#4 Head of Track D
TKI#5 Midpoint of Track D
TKI#6 Midpoint of Track D
TKI#7 End of Track D
TKI#8 Track E
TA1
TA2
TA3
TL4
TL5
TL6
AOB001. SA1
AOB002. SA1
AOB003. SA1
AOB004. SA1
AOB005. SA1
AOB006. SA1
AOB007. SA1
AOB008. SA1

FIG. 41

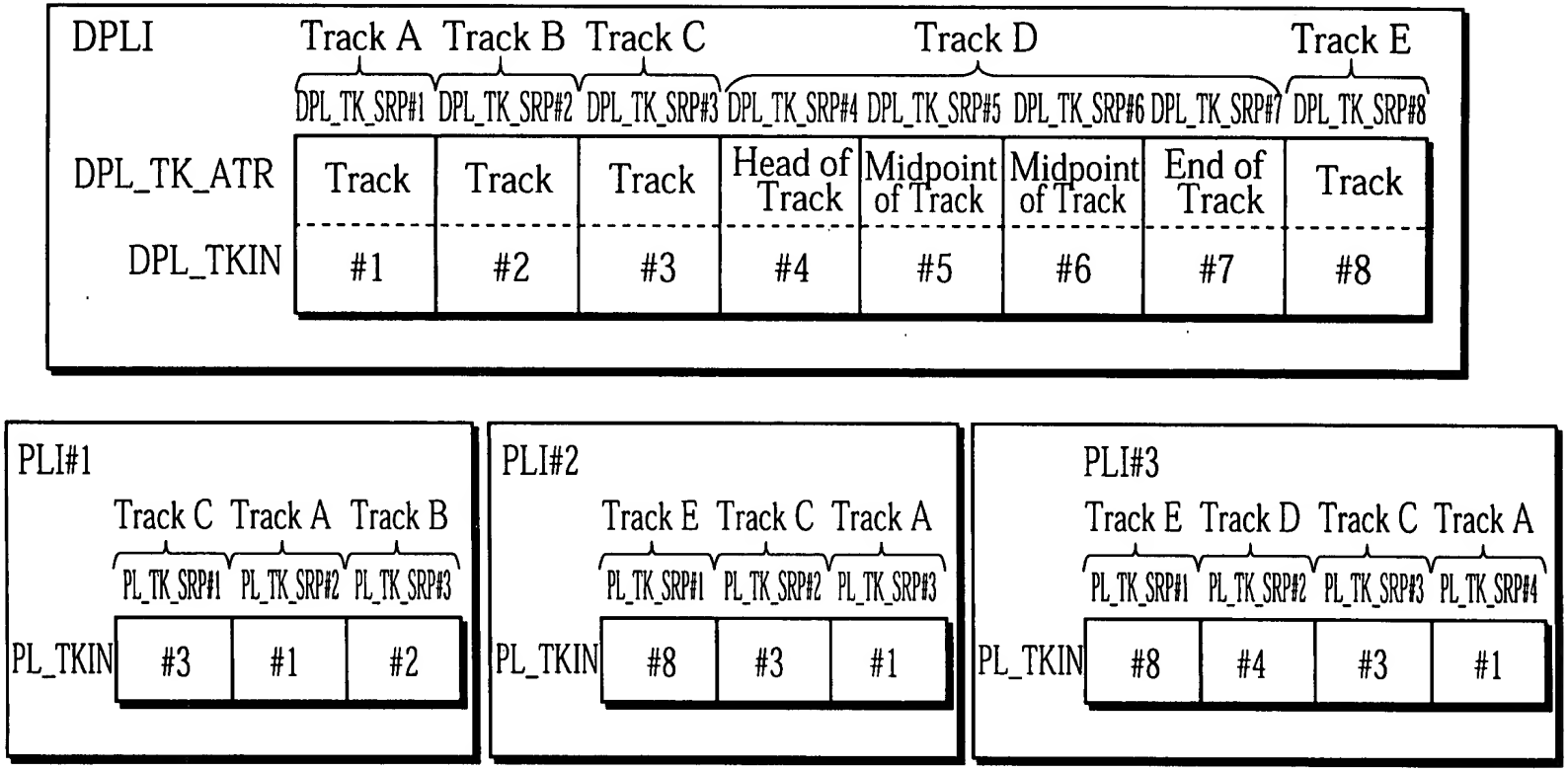

DPLI
Track A
Track B
Track C
Track D
Track E
DPL_TK_SRP#1
DPL_TK_SRP#2
DPL_TK_SRP#3
DPL_TK_SRP#4
DPL_TK_SRP#5
DPL_TK_SRP#6
DPL_TK_SRP#7
DPL_TK_SRP#8
DPL_TK_ATR
Track
Track
Track
Head of Track
Midpoint of Track
Midpoint of Track
End of Track
Track
DPL_TKIN
#1
#2
#3
#4
#5
#6
#7
#8
PLI#1
Track C
Track A
Track B
PL_TK_SRP#1
PL_TK_SRP#2
PL_TK_SRP#3
PL_TKIN
#3
#1
#2
PLI#2
Track E
Track C
Track A
PL_TK_SRP#1
PL_TK_SRP#2
PL_TK_SRP#3
PL_TKIN
#8
#3
#1
PLI#3
Track E
Track D
Track C
Track A
PL_TK_SRP#1
PL_TK_SRP#2
PL_TK_SRP#3
PL_TK_SRP#4
PL_TKIN
#8
#4
#3
#1

FIG. 42

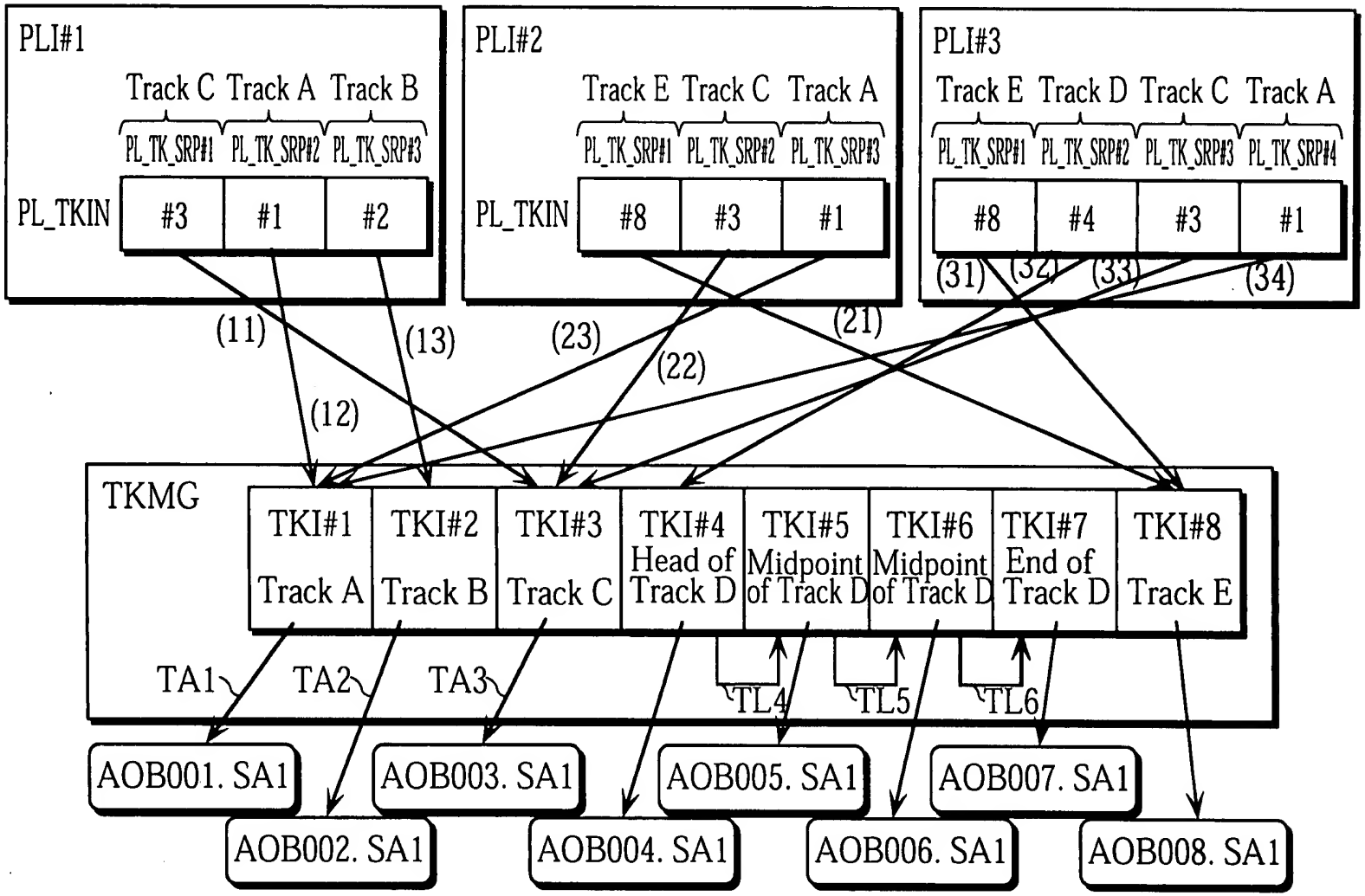

PLI#1
Track C Track A Track B
PL_TK_SRP#1 PL_TK_SRP#2 PL_TK_SRP#3
PL_TKIN
#3 #1 #2
PLI#2
Track E Track C Track A
PL_TK_SRP#1 PL_TK_SRP#2 PL_TK_SRP#3
PL_TKIN
#8 #3 #1
PLI#3
Track E Track D Track C Track A
PL_TK_SRP#1 PL_TK_SRP#2 PL_TK_SRP#3 PL_TK_SRP#4
#8 #4 #3 #1
(31) (32) (33) (34)
(11) (12) (13) (21) (22) (23)
TKMG
TKI#1 Track A
TKI#2 Track B
TKI#3 Track C
TKI#4 Head of Track D
TKI#5 Midpoint of Track D
TKI#6 Midpoint of Track D
TKI#7 End of Track D
TKI#8 Track E
TA1 TA2 TA3
TL4 TL5 TL6
AOB001. SA1
AOB002. SA1
AOB003. SA1
AOB004. SA1
AOB005. SA1
AOB006. SA1
AOB007. SA1
AOB008. SA1

FIG. 43A

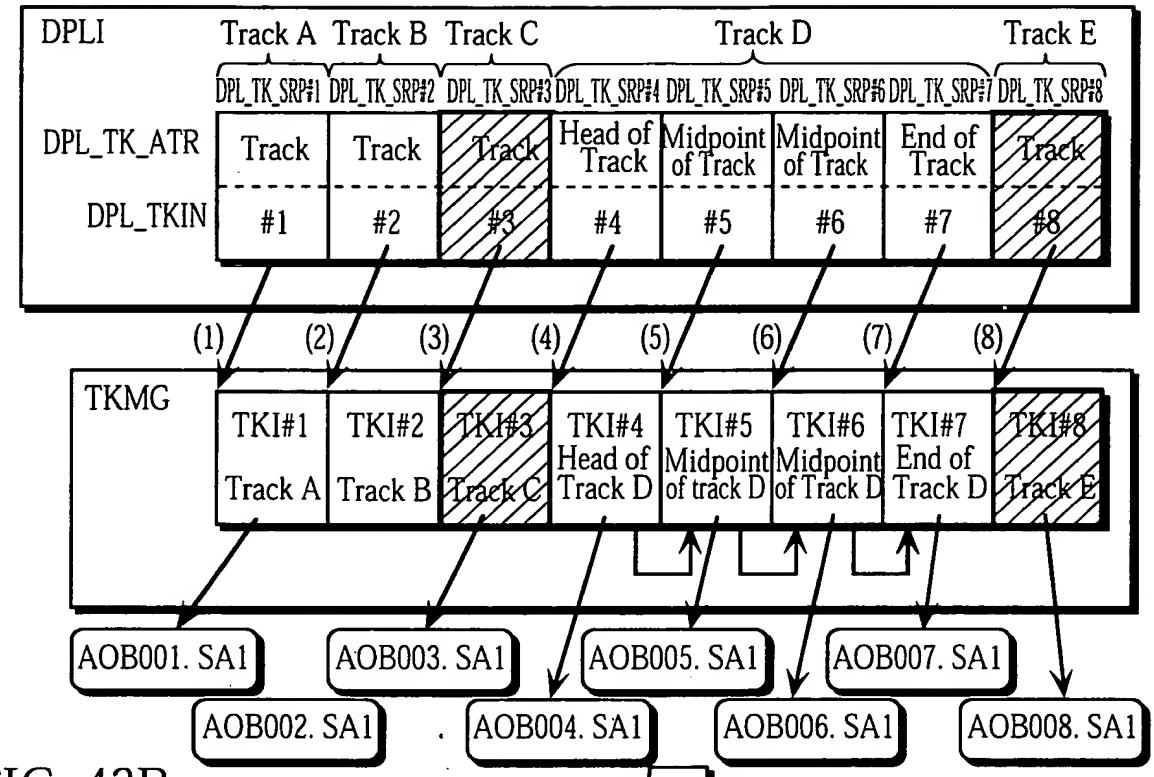


FIG. 43B

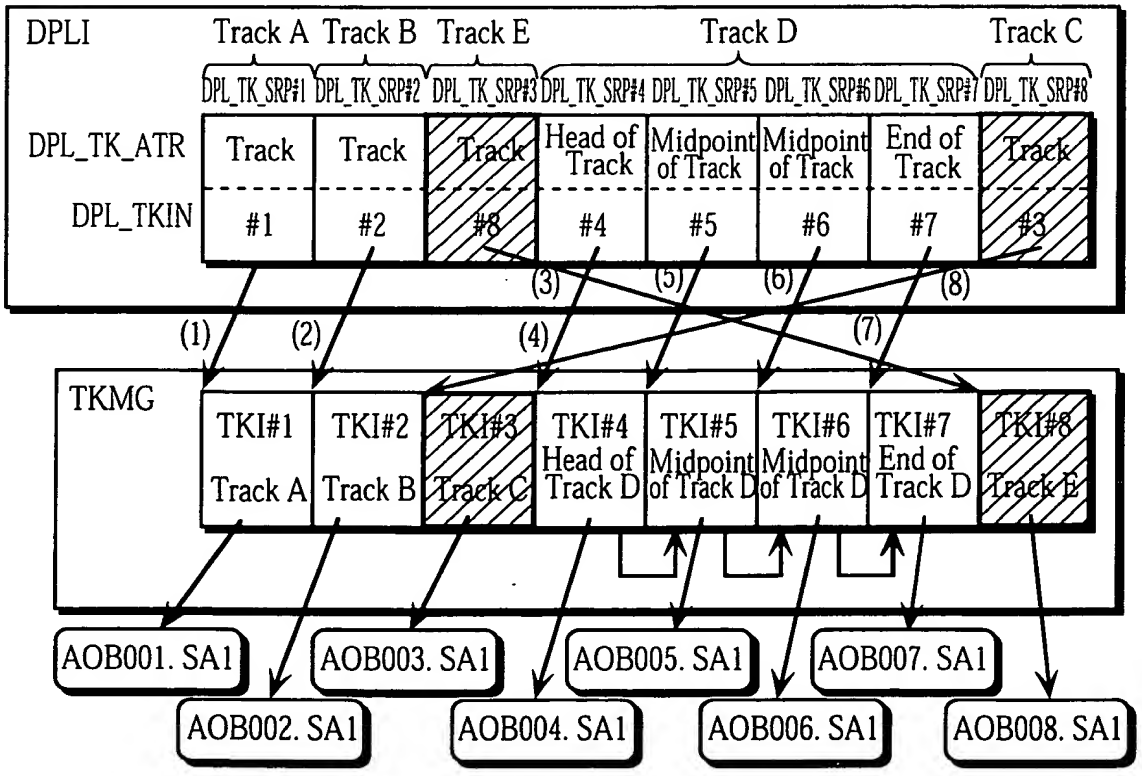


FIG. 44A

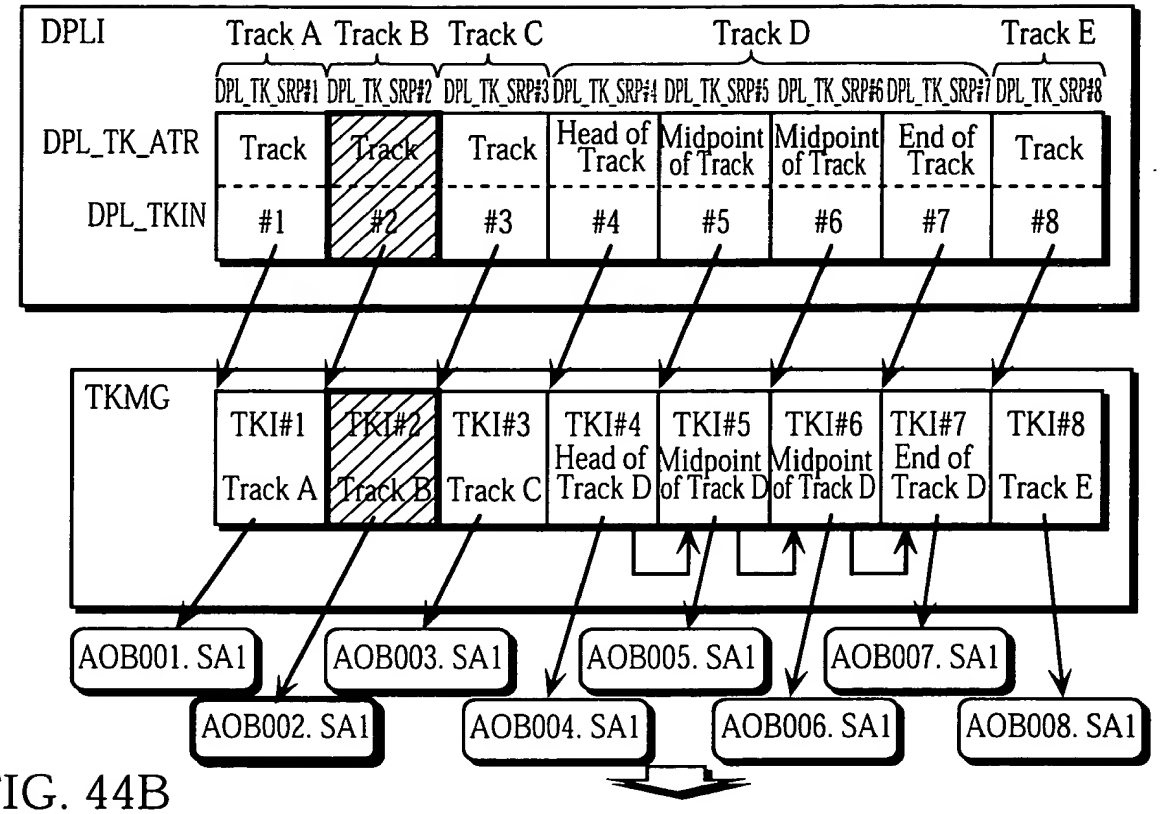


FIG. 44B

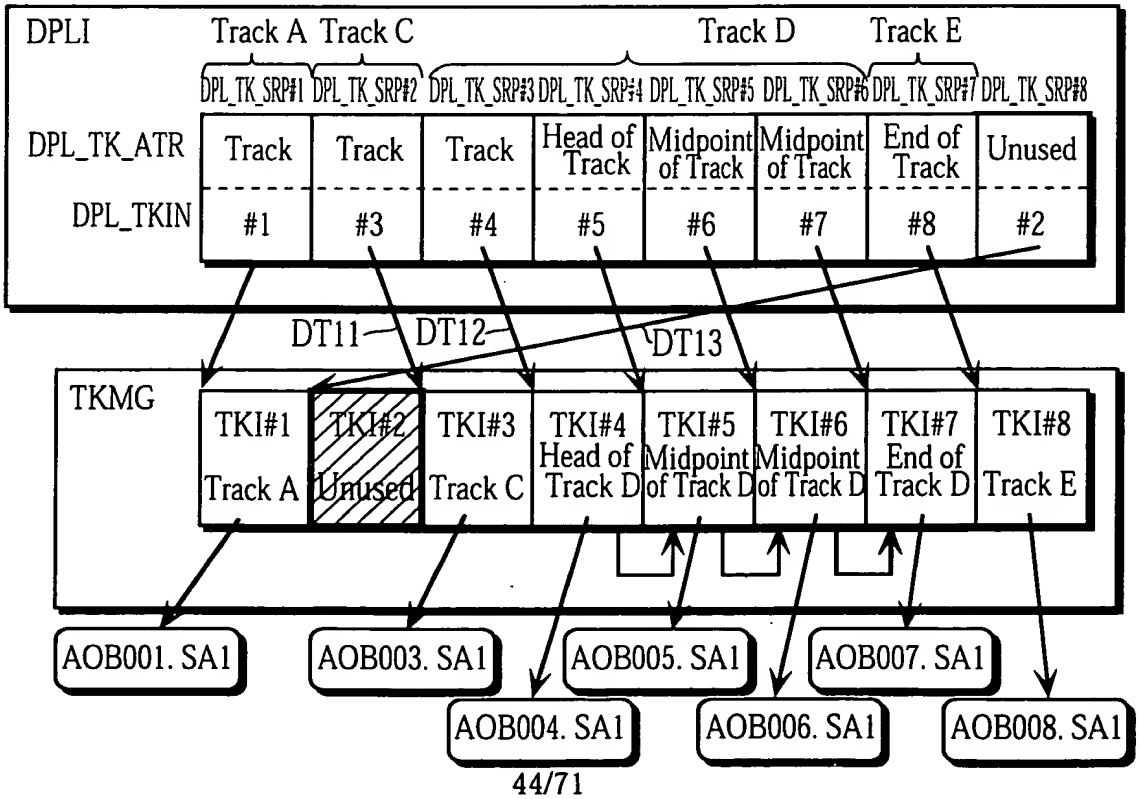


FIG. 45A

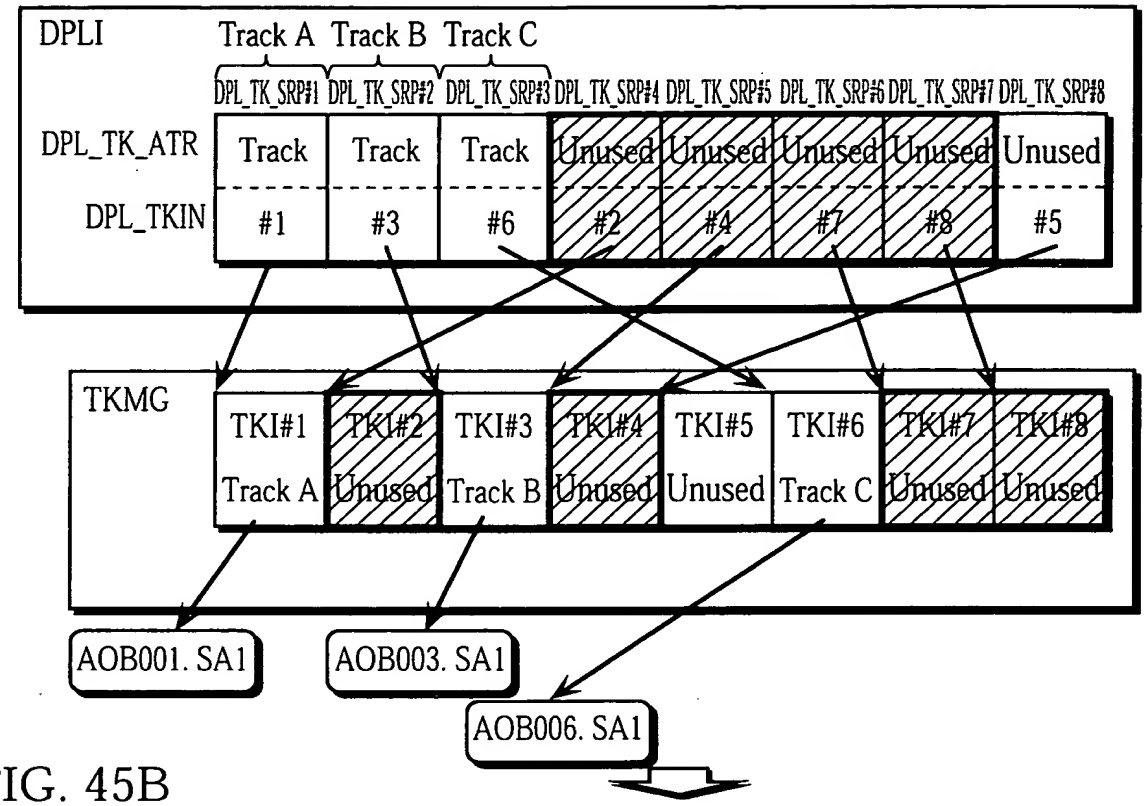


FIG. 45B

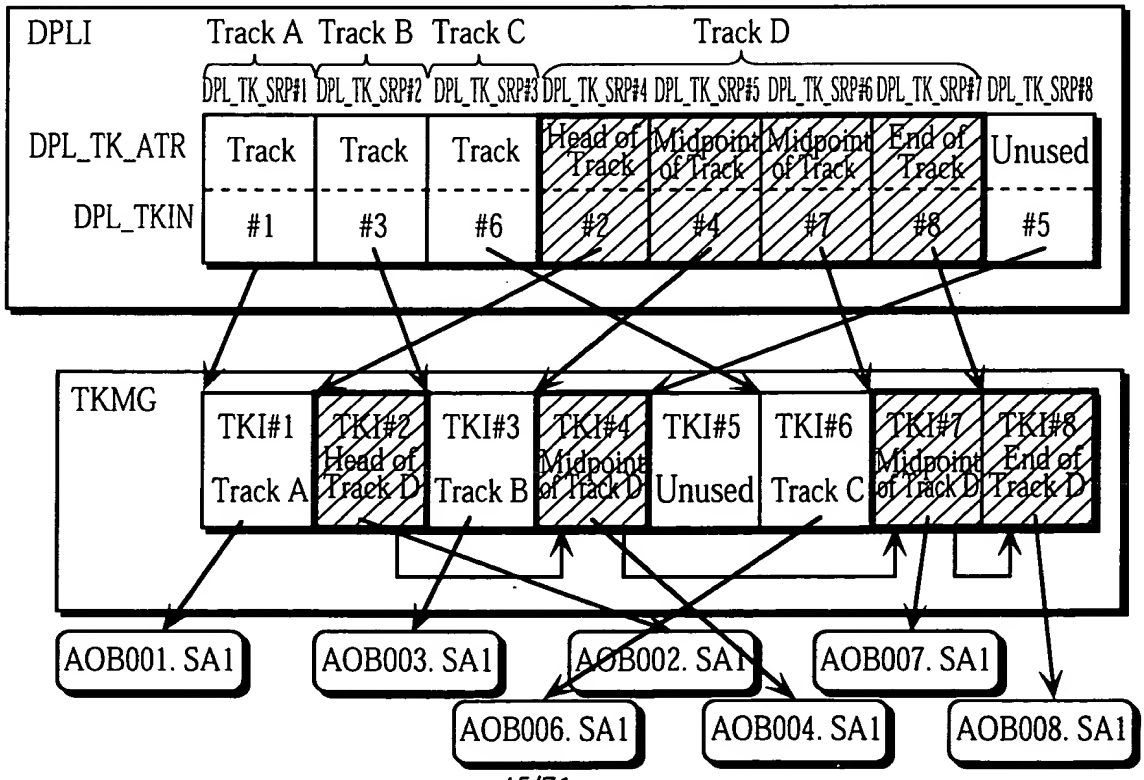


FIG. 46A

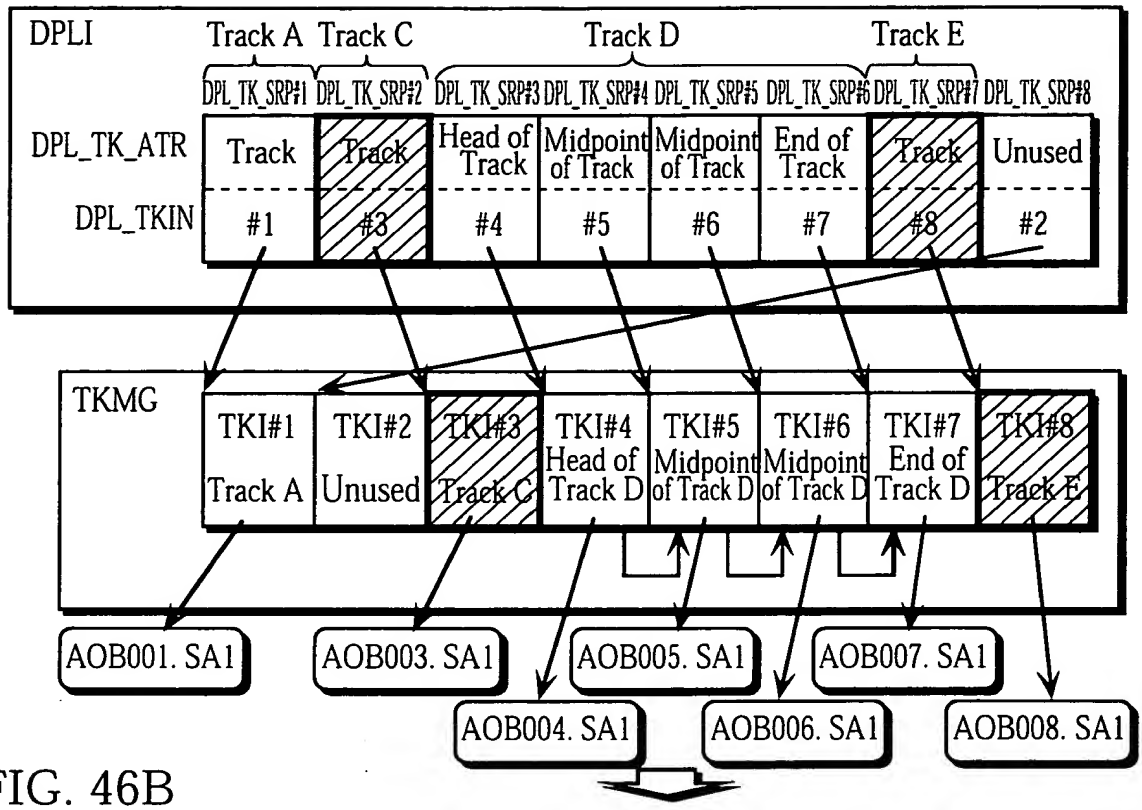
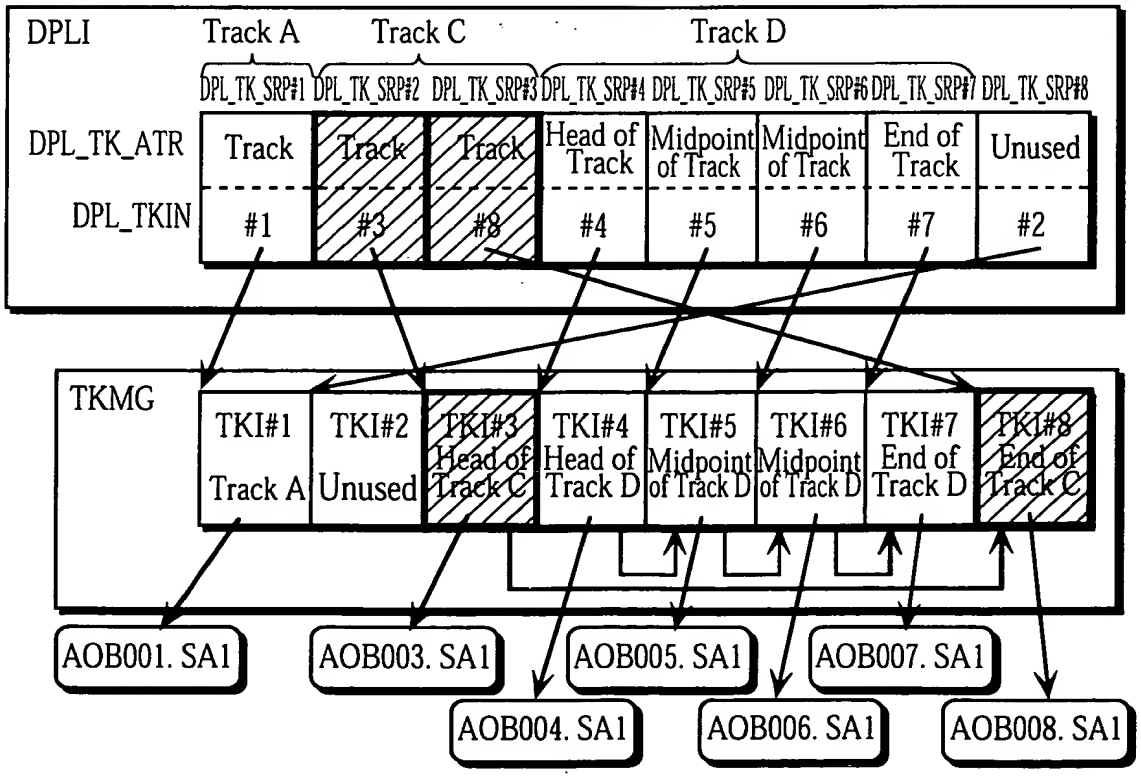


FIG. 46B



US005805504-052600

FIG. 47A

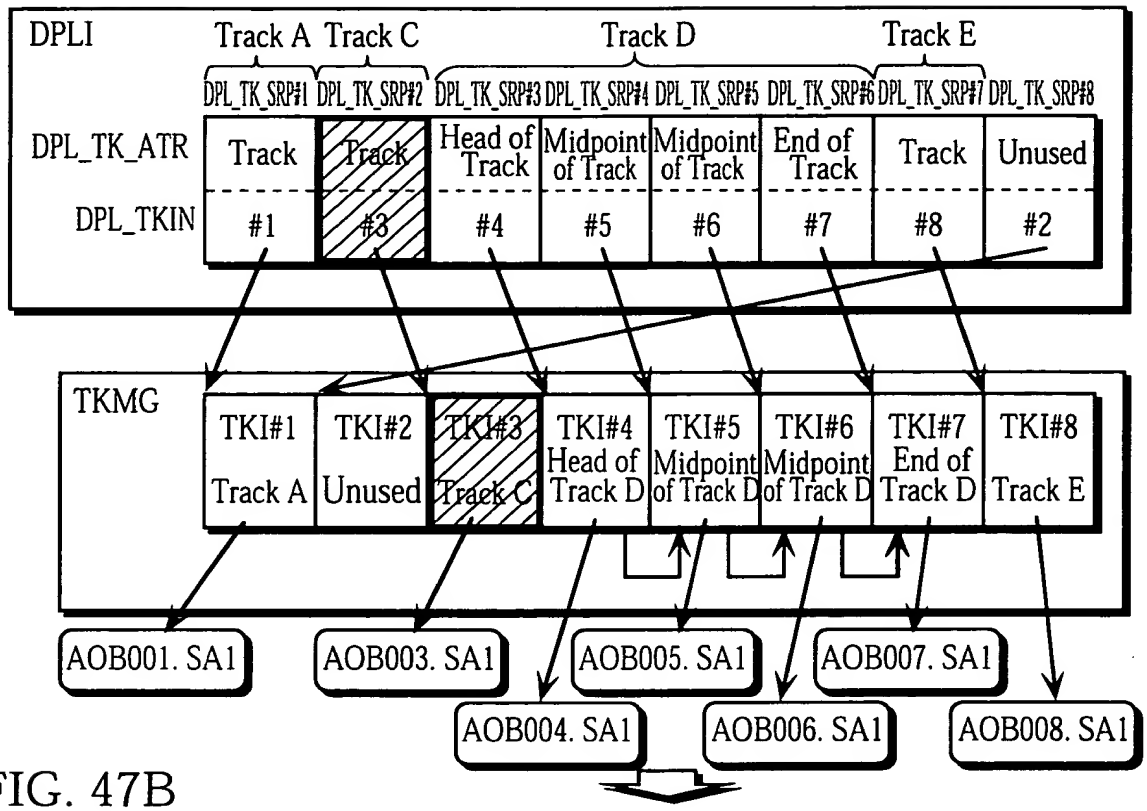
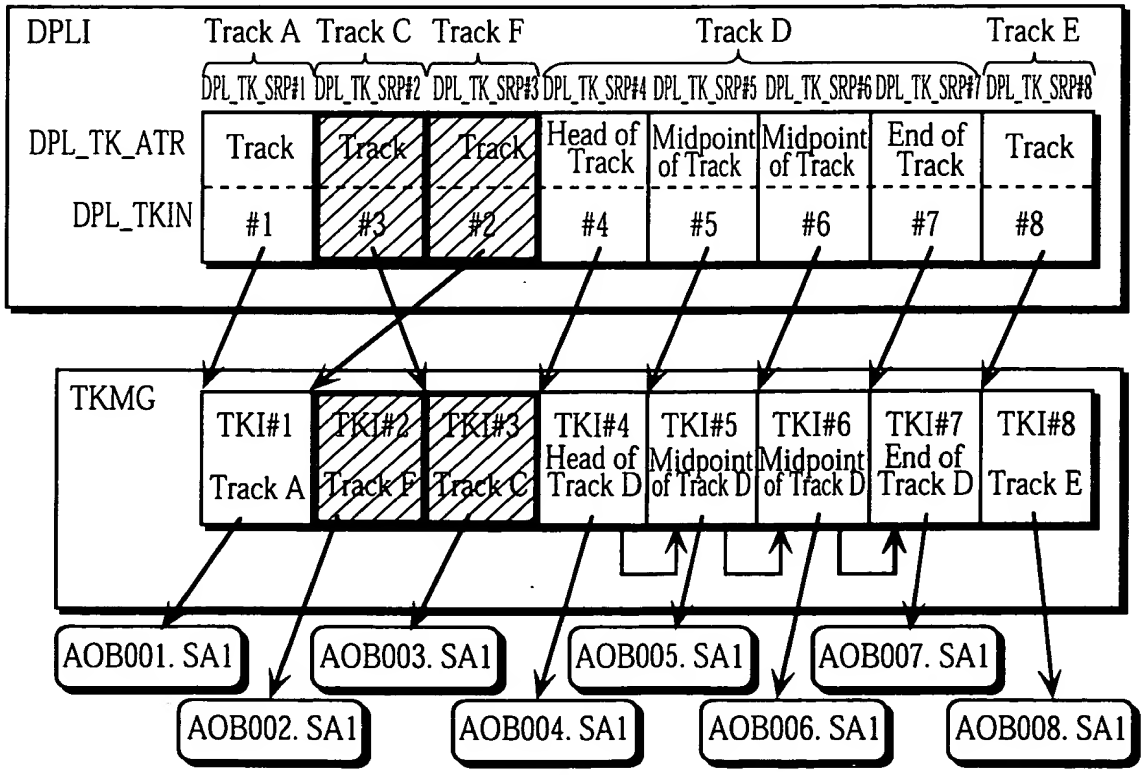
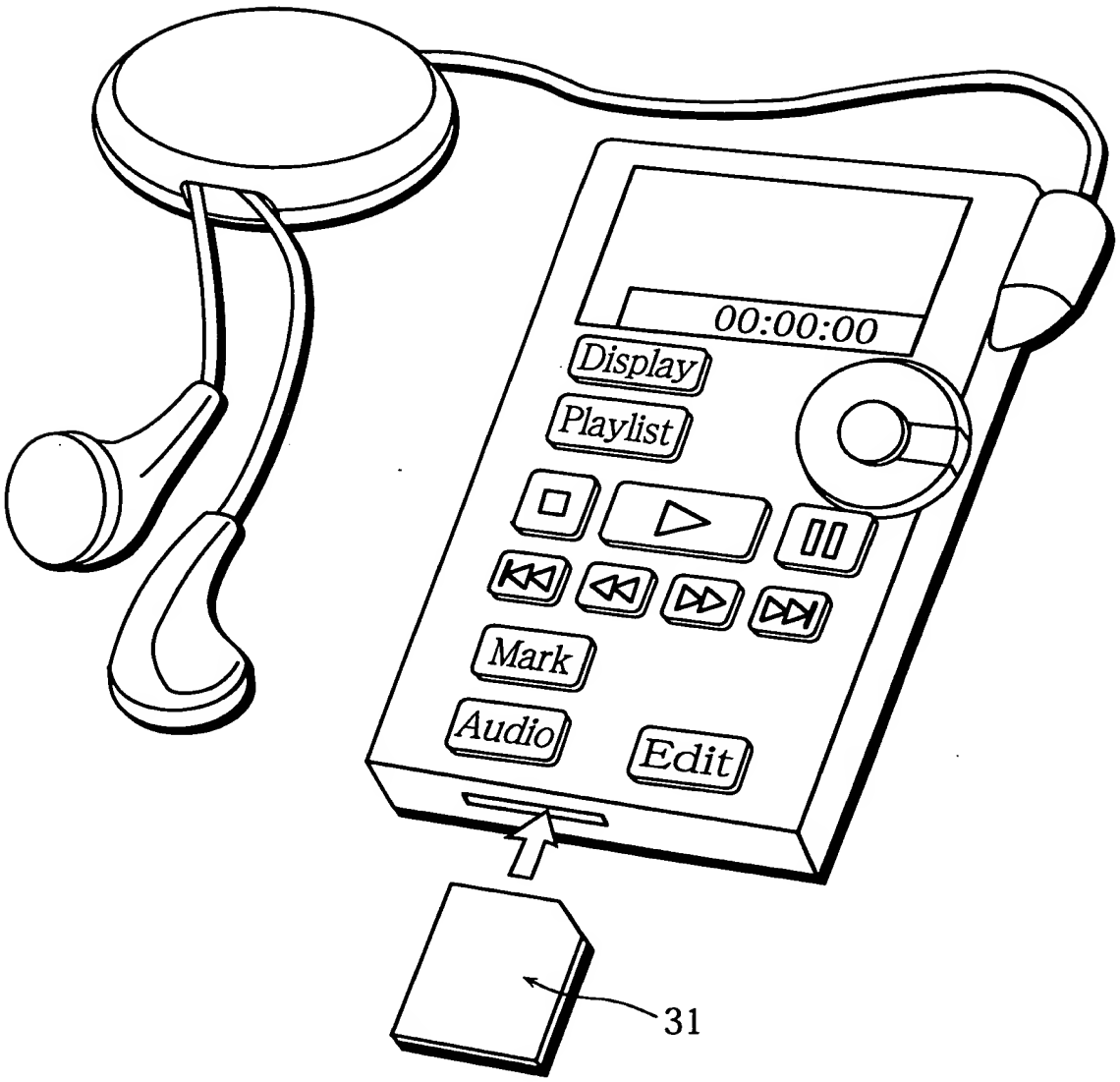


FIG. 47B



0958060501-052600

FIG. 48



0550604-050900

FIG. 49

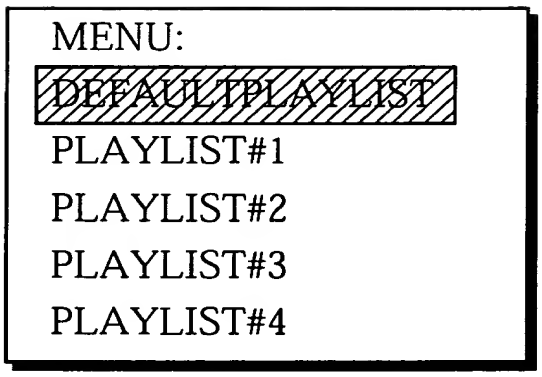


FIG. 50A

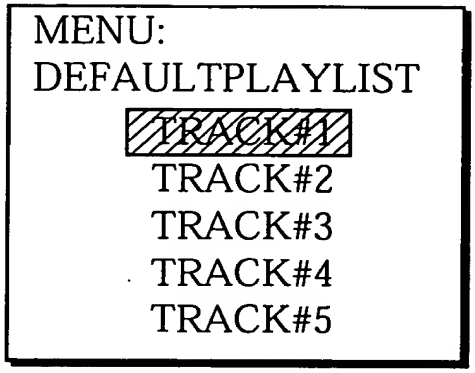


FIG. 50B

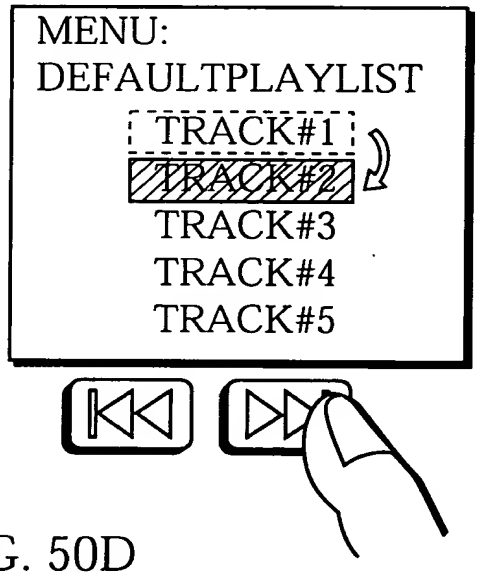


FIG. 50C

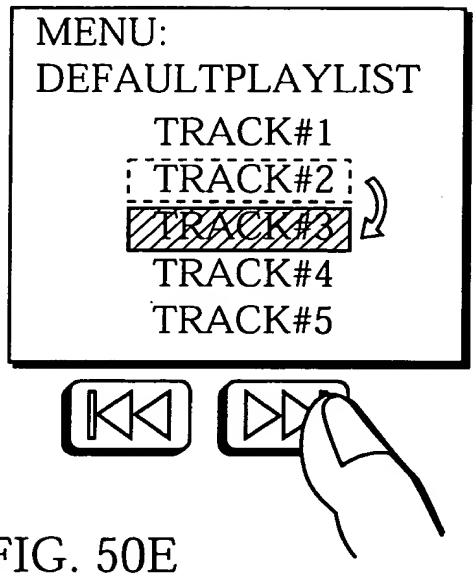


FIG. 50D

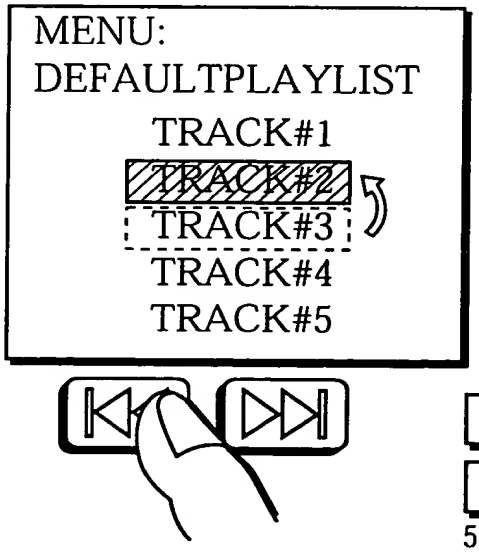
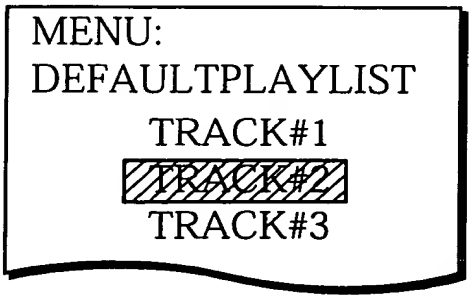


FIG. 50E



PLAY ···INDICATES THAT TRACK#2 SHOULD BE PLAYED BACK

Playlist ···INDICATES THAT TRACK#2 SHOULD BE EDITED

0055804-055300

FIG. 51A

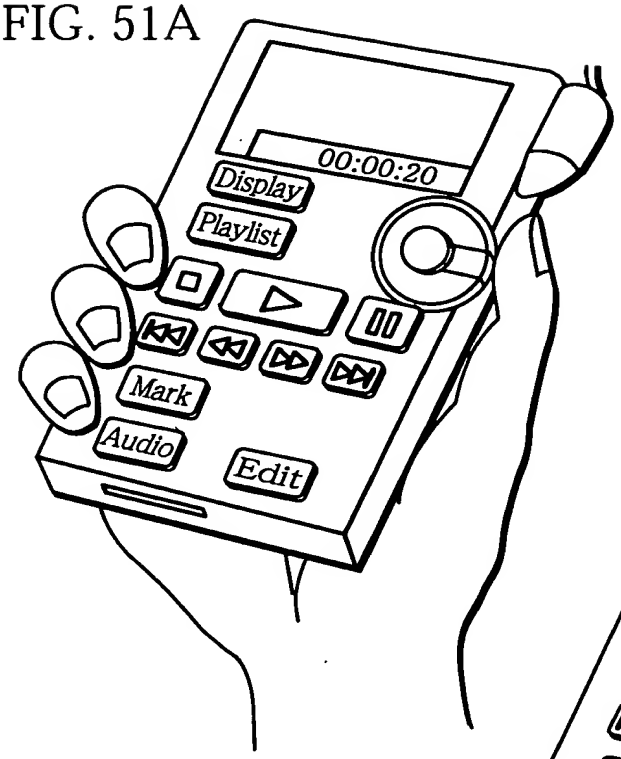


FIG. 51C

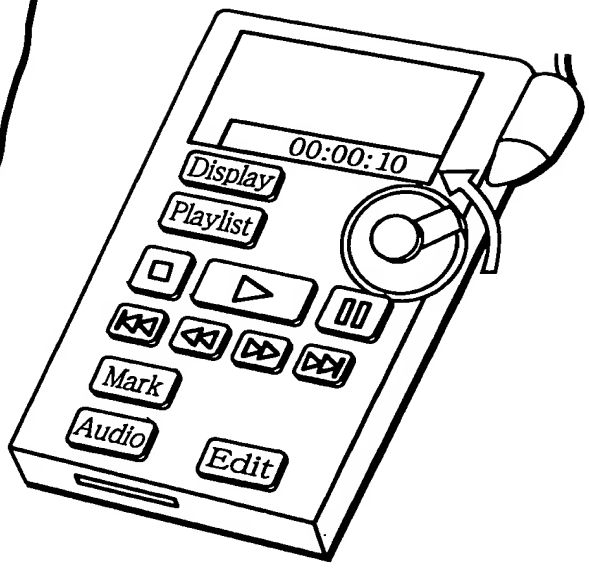
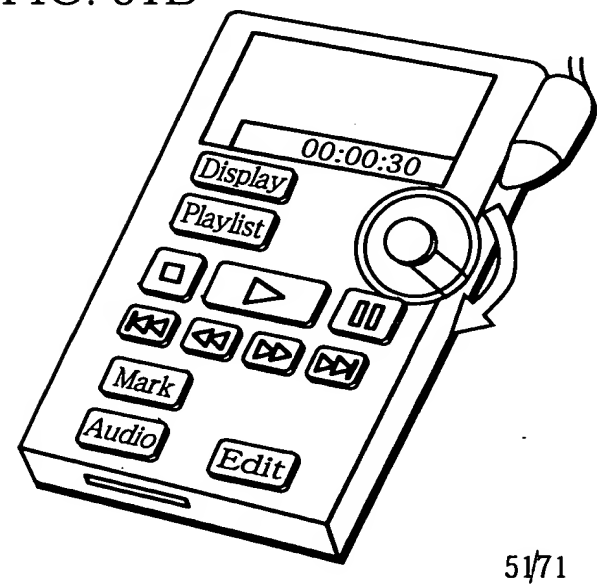


FIG. 51B



05580501 - 052500

FIG. 52

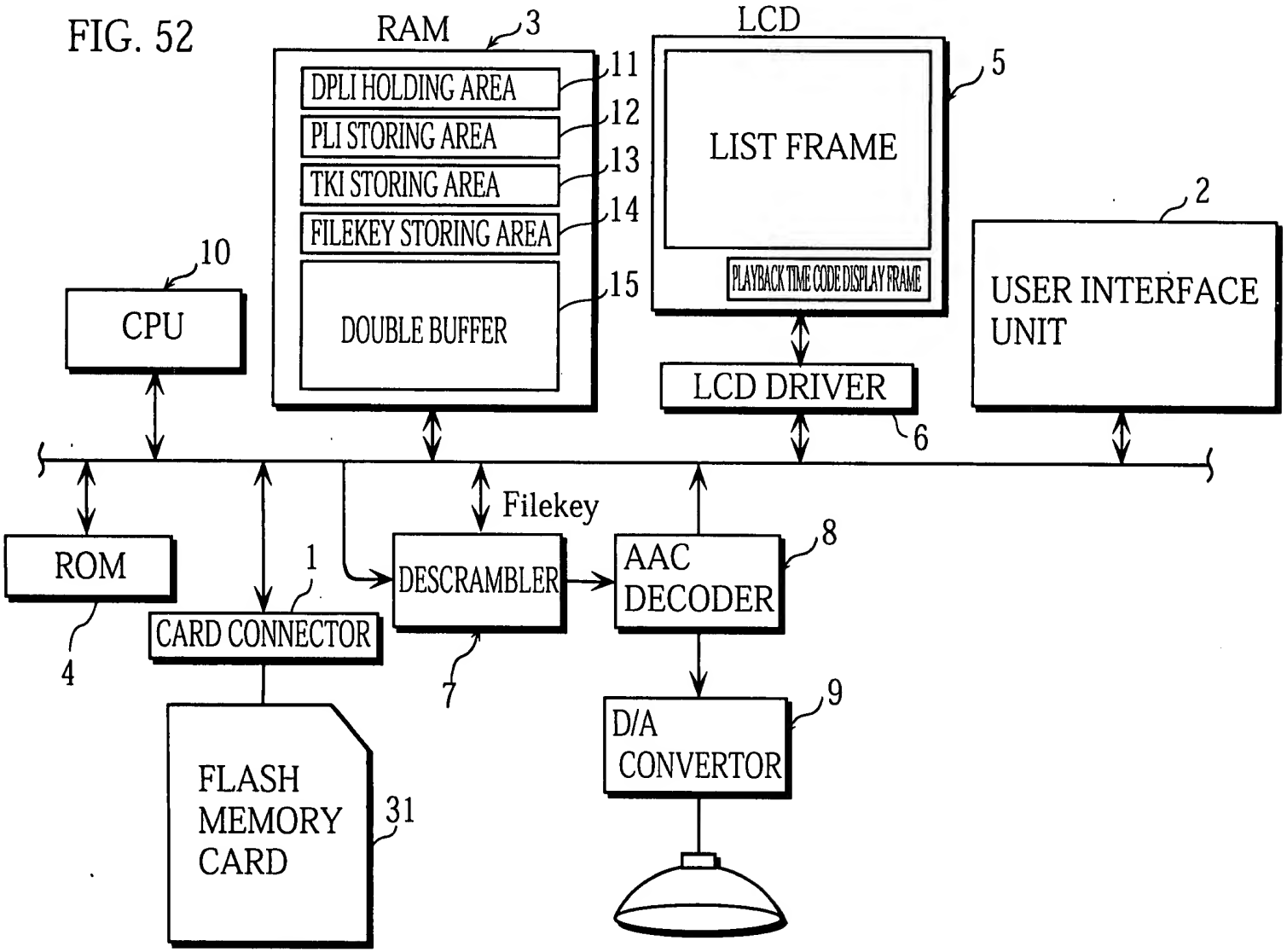

RAM
3
DPLI HOLDING AREA
11
PLI STORING AREA
12
TKI STORING AREA
13
FILEKEY STORING AREA
14
DOUBLE BUFFER
15
LCD
5
LIST FRAME
PLAYBACK TIME CODE DISPLAY FRAME
2
USER INTERFACE UNIT
10
CPU
LCD DRIVER
6
Filekey
ROM
4
1
CARD CONNECTOR
DESCRAMBLER
7
AAC DECODER
8
D/A CONVERTOR
9
FLASH MEMORY CARD
31

FIG. 53

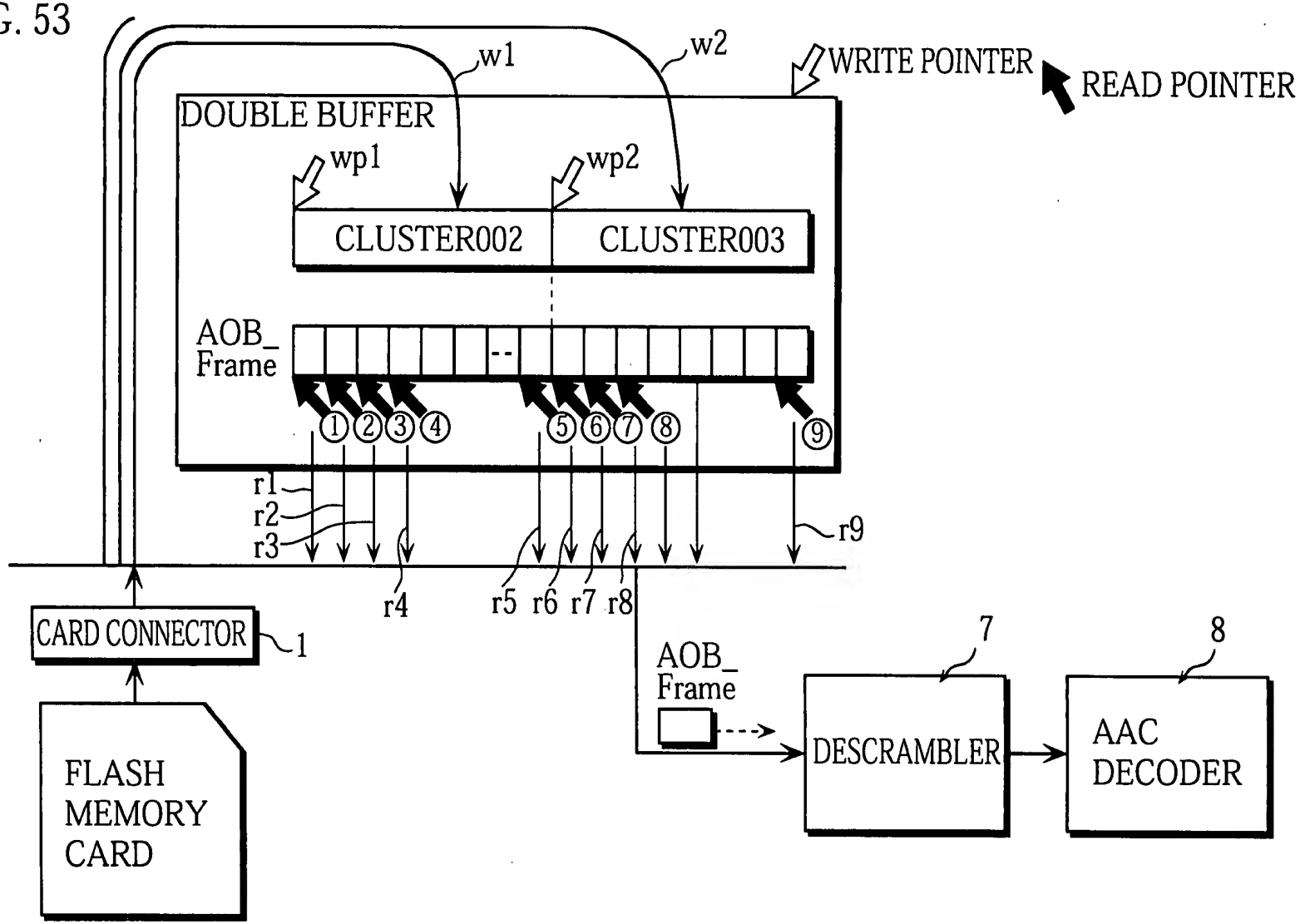

w1
w2
WRITE POINTER
READ POINTER
DOUBLE BUFFER
wp1
wp2
CLUSTER002
CLUSTER003
AOB_
Frame
①②③④
⑤⑥⑦⑧
⑨
r1
r2
r3
r4
r5 r6 r7 r8
r9
CARD CONNECTOR
1
FLASH
MEMORY
CARD
AOB_
Frame
7
DESCRAMBLER
8
AAC
DECODER

FIG. 54A

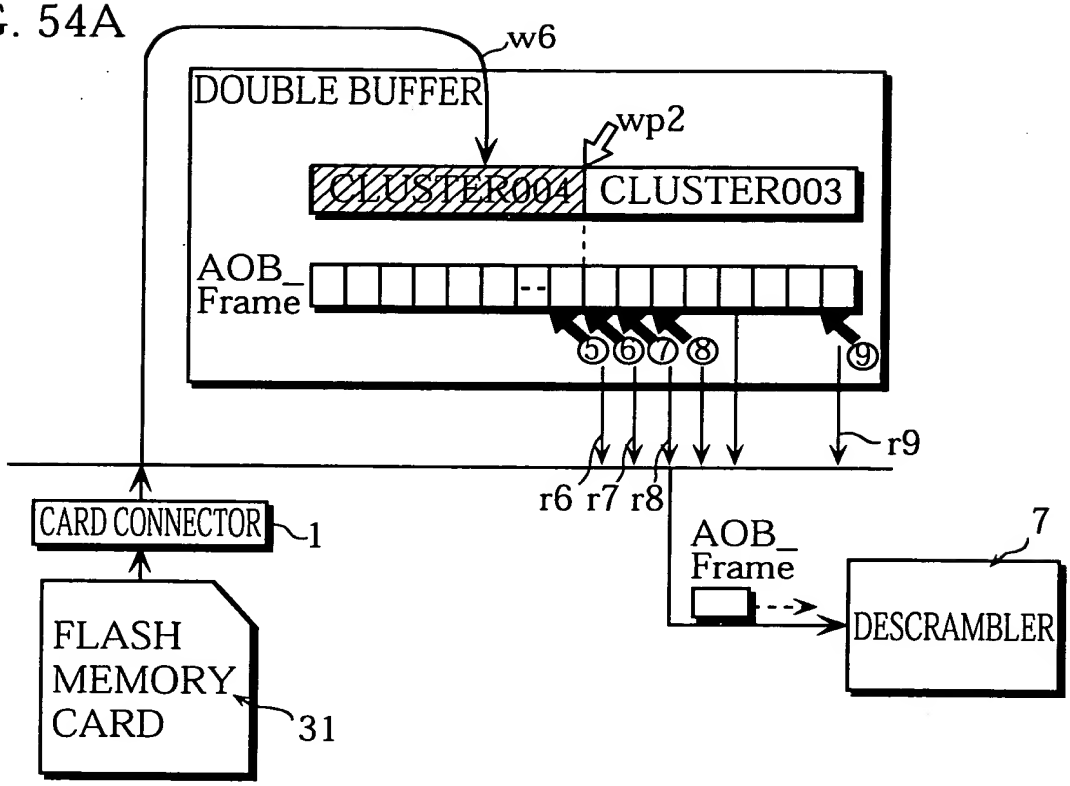
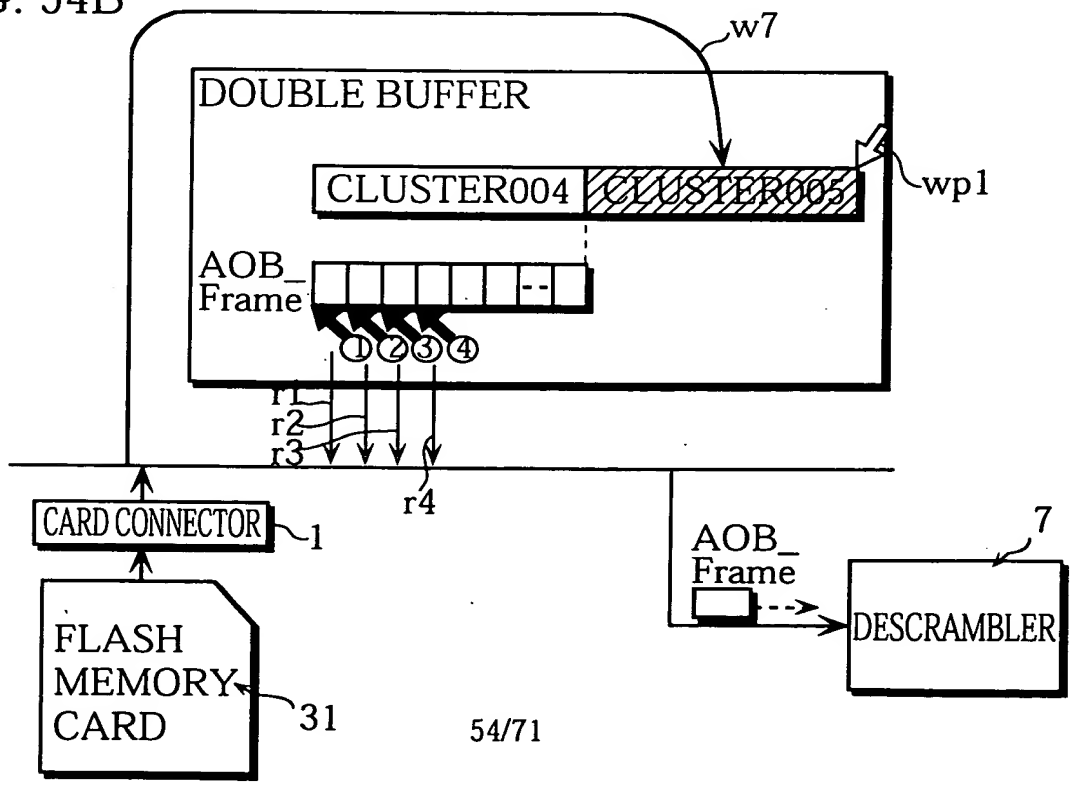


FIG. 54B



0956060-050600

FIG. 55

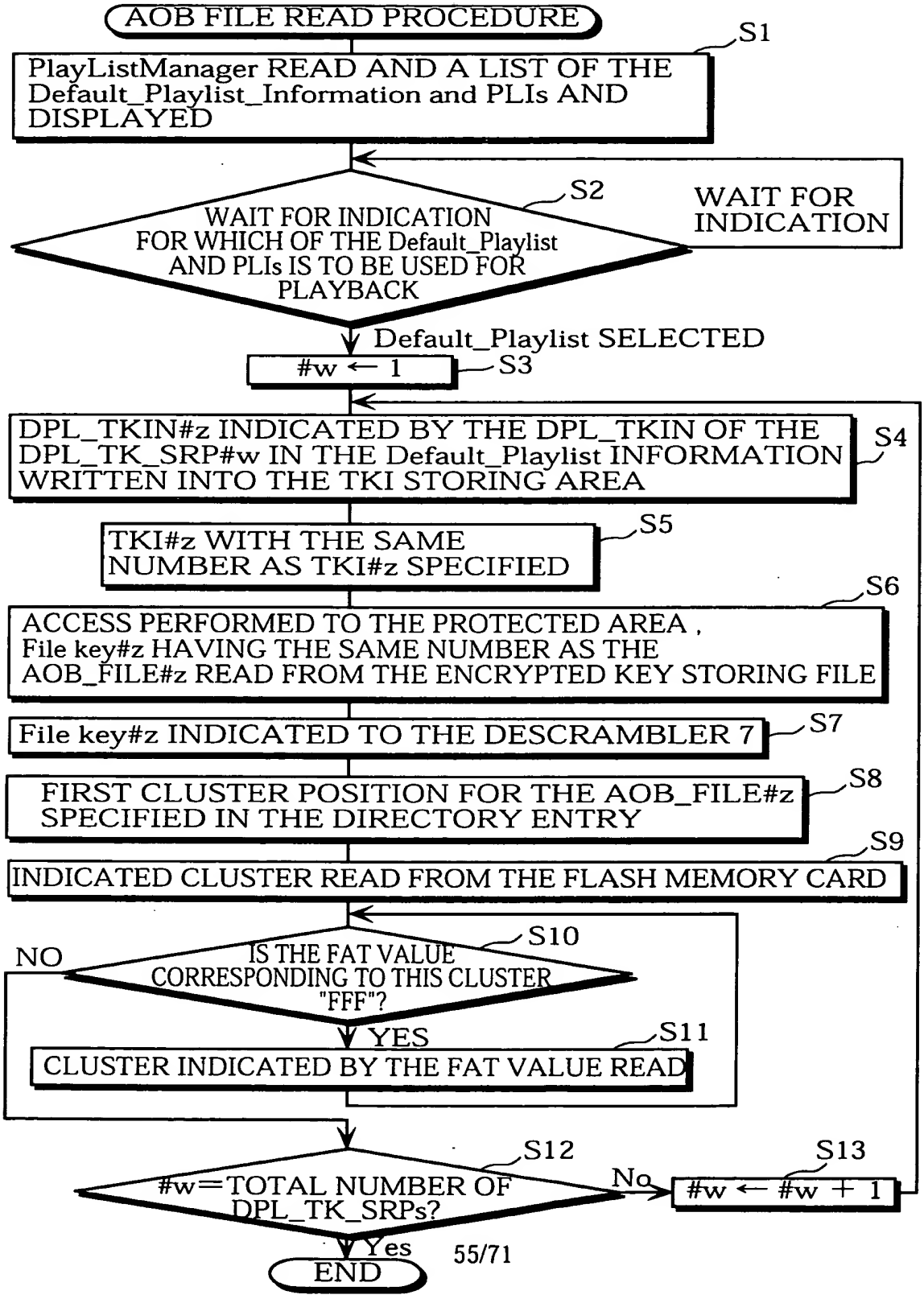

AOB FILE READ PROCEDURE
S1
PlayListManager READ AND A LIST OF THE Default_Playlist_Information and PLIs AND DISPLAYED
S2
WAIT FOR INDICATION FOR WHICH OF THE Default_Playlist AND PLIs IS TO BE USED FOR PLAYBACK
WAIT FOR INDICATION
Default_Playlist SELECTED
#w ← 1
S3
DPL_TKIN#z INDICATED BY THE DPL_TKIN OF THE DPL_TK_SRP#w IN THE Default_Playlist INFORMATION WRITTEN INTO THE TKI STORING AREA
S4
TKI#z WITH THE SAME NUMBER AS TKI#z SPECIFIED
S5
ACCESS PERFORMED TO THE PROTECTED AREA , File key#z HAVING THE SAME NUMBER AS THE AOB_FILE#z READ FROM THE ENCRYPTED KEY STORING FILE
S6
File key#z INDICATED TO THE DESCRAMBLER 7
S7
FIRST CLUSTER POSITION FOR THE AOB_FILE#z SPECIFIED IN THE DIRECTORY ENTRY
S8
INDICATED CLUSTER READ FROM THE FLASH MEMORY CARD
S9
NO
IS THE FAT VALUE CORRESPONDING TO THIS CLUSTER "FFF"?
S10
YES
CLUSTER INDICATED BY THE FAT VALUE READ
S11
#w=TOTAL NUMBER OF DPL_TK_SRPs?
S12
No
#w ← #w + 1
S13
Yes
END

FIG. 56

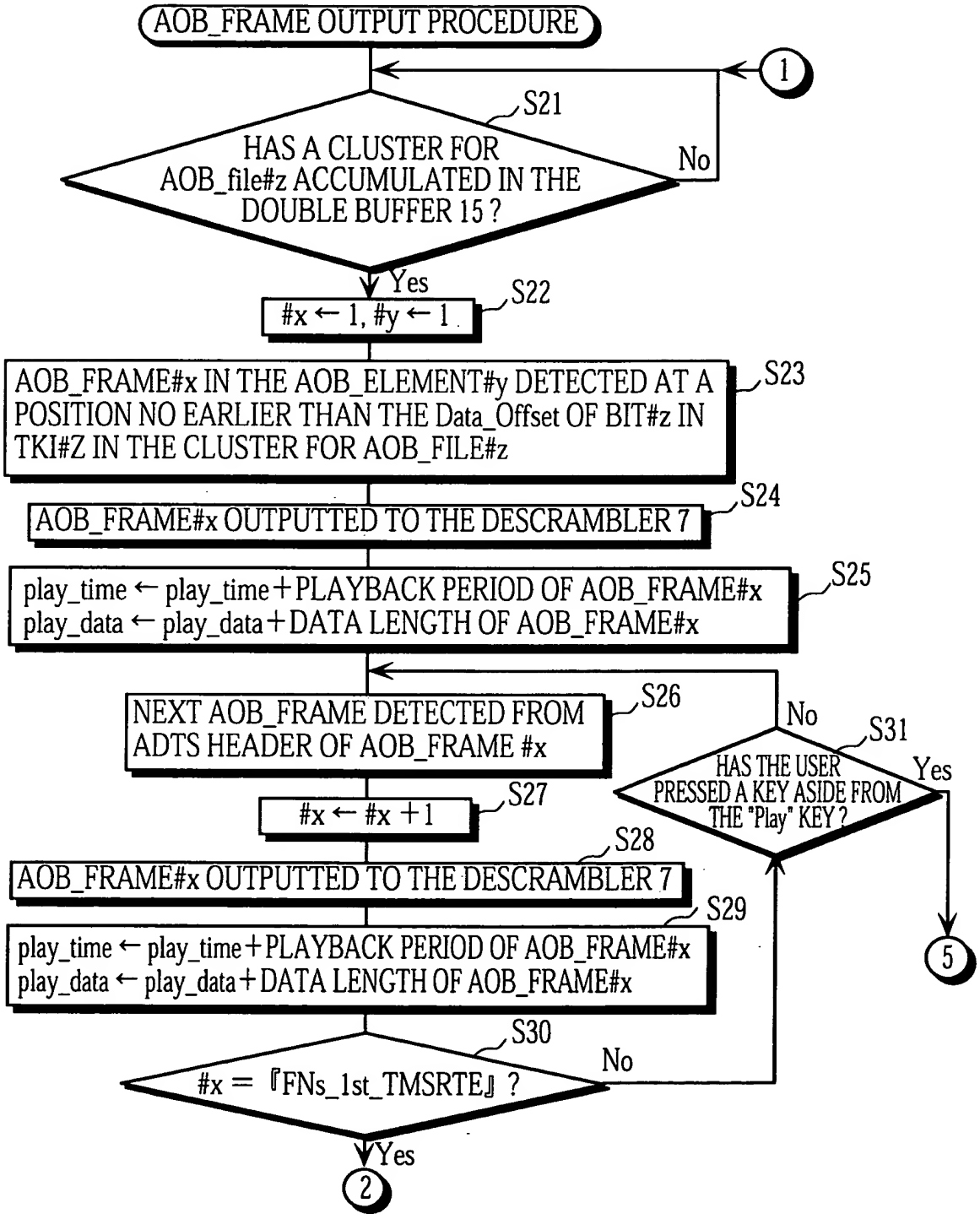

AOB_FRAME OUTPUT PROCEDURE
1
S21
HAS A CLUSTER FOR AOB_file#z ACCUMULATED IN THE DOUBLE BUFFER 15 ?
No
Yes
S22
#x ← 1, #y ← 1
S23
AOB_FRAME#x IN THE AOB_ELEMENT#y DETECTED AT A POSITION NO EARLIER THAN THE Data_Offset OF BIT#z IN TKI#Z IN THE CLUSTER FOR AOB_FILE#z
S24
AOB_FRAME#x OUTPUTTED TO THE DESCRAMBLER 7
S25
play_time ← play_time + PLAYBACK PERIOD OF AOB_FRAME#x
play_data ← play_data + DATA LENGTH OF AOB_FRAME#x
S26
NEXT AOB_FRAME DETECTED FROM ADTS HEADER OF AOB_FRAME #x
S27
#x ← #x + 1
S28
AOB_FRAME#x OUTPUTTED TO THE DESCRAMBLER 7
S29
play_time ← play_time + PLAYBACK PERIOD OF AOB_FRAME#x
play_data ← play_data + DATA LENGTH OF AOB_FRAME#x
S30
#x = 『FNs_1st_TMSRTE』 ?
No
Yes
2
S31
HAS THE USER PRESSED A KEY ASIDE FROM THE "Play" KEY ?
No
Yes
5

FIG. 57

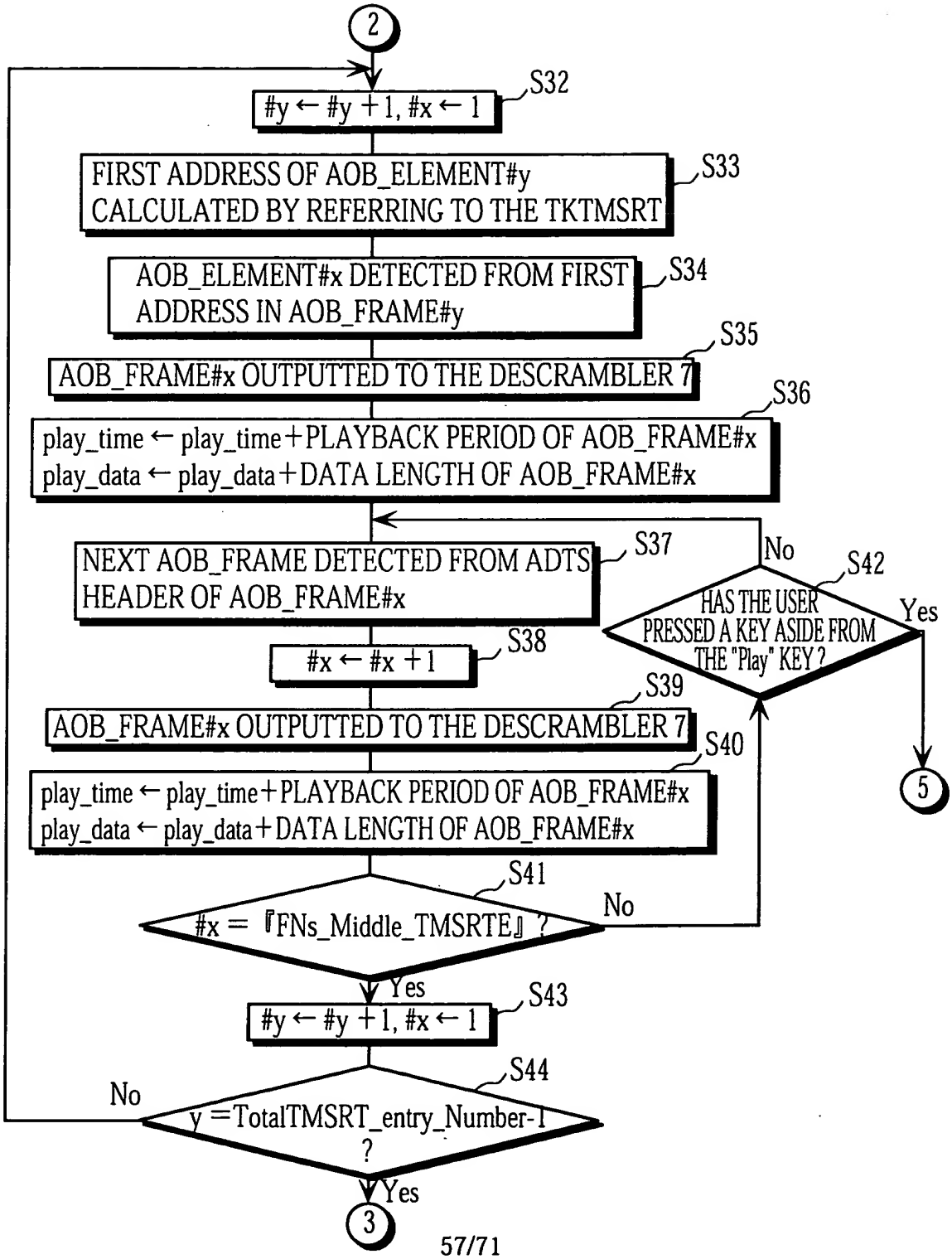

2
S32
#y ← #y + 1, #x ← 1
S33
FIRST ADDRESS OF AOB_ELEMENT#y CALCULATED BY REFERRING TO THE TKTMSRT
S34
AOB_ELEMENT#x DETECTED FROM FIRST ADDRESS IN AOB_FRAME#y
S35
AOB_FRAME#x OUTPUTTED TO THE DESCRAMBLER 7
S36
play_time ← play_time + PLAYBACK PERIOD OF AOB_FRAME#x
play_data ← play_data + DATA LENGTH OF AOB_FRAME#x
S37
NEXT AOB_FRAME DETECTED FROM ADTS HEADER OF AOB_FRAME#x
S38
#x ← #x + 1
S39
AOB_FRAME#x OUTPUTTED TO THE DESCRAMBLER 7
S40
play_time ← play_time + PLAYBACK PERIOD OF AOB_FRAME#x
play_data ← play_data + DATA LENGTH OF AOB_FRAME#x
S41
#x = 『FNs_Middle_TMSRTE』 ?
No
Yes
S42
HAS THE USER PRESSED A KEY ASIDE FROM THE "Play" KEY ?
No
Yes
5
S43
#y ← #y + 1, #x ← 1
S44
y = TotalTMSRT_entry_Number-1 ?
No
Yes
3

FIG. 58

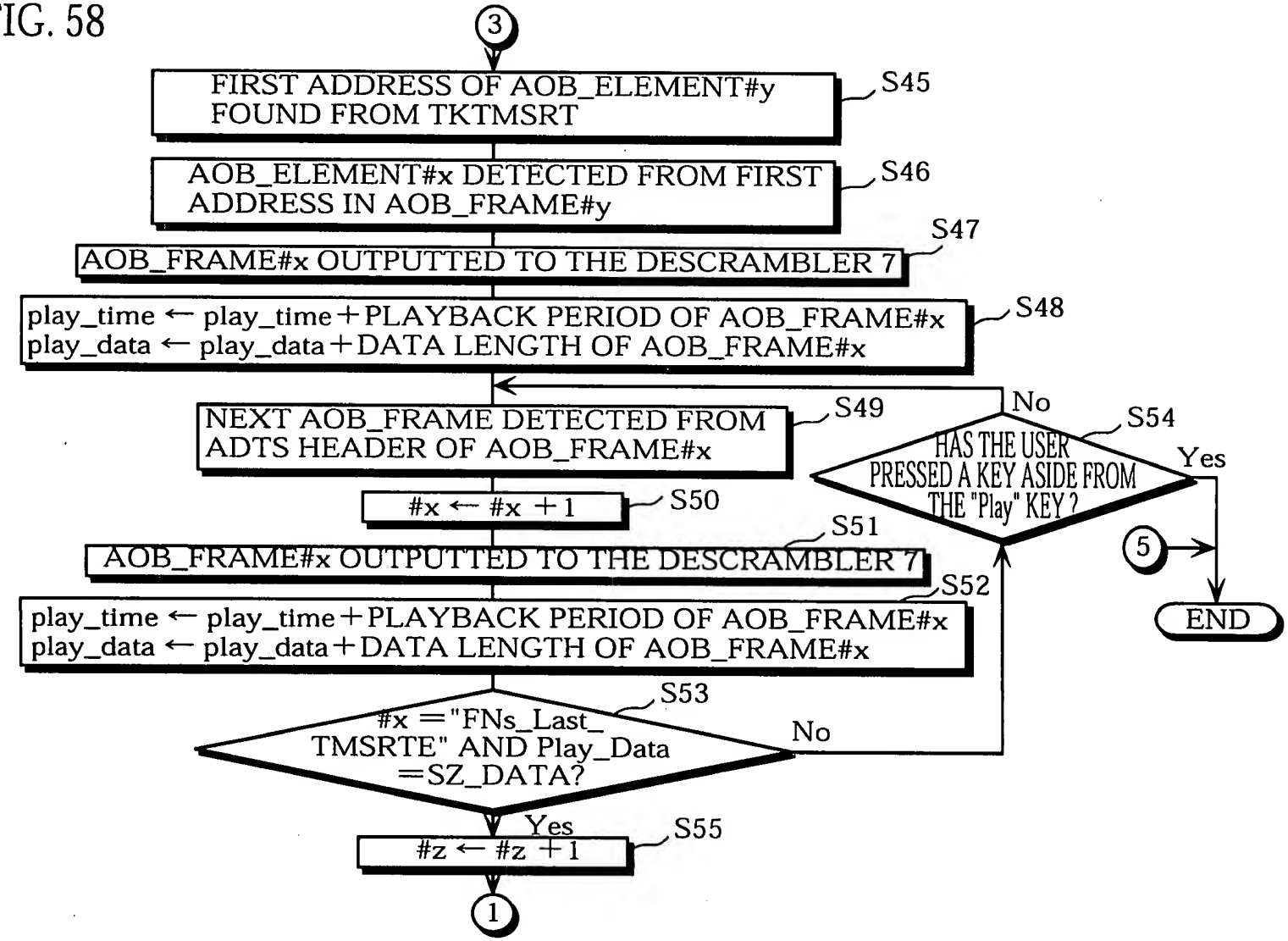
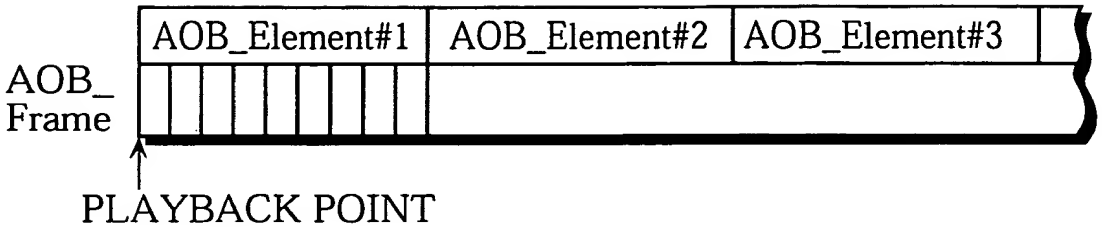
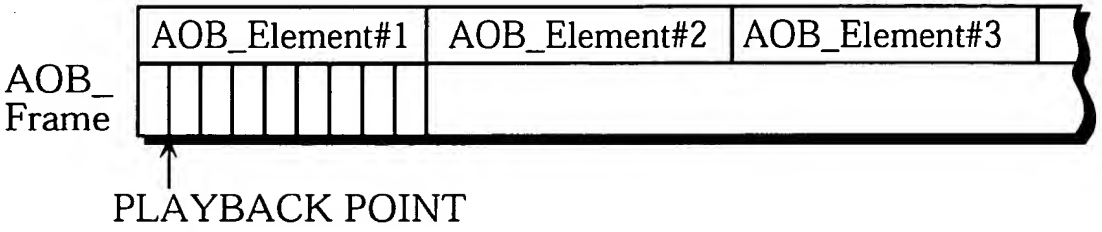

3
FIRST ADDRESS OF AOB_ELEMENT#y FOUND FROM TKTMSRT
S45
AOB_ELEMENT#x DETECTED FROM FIRST ADDRESS IN AOB_FRAME#y
S46
S47
AOB_FRAME#x OUTPUTTED TO THE DESCRAMBLER 7
play_time ← play_time + PLAYBACK PERIOD OF AOB_FRAME#x
play_data ← play_data + DATA LENGTH OF AOB_FRAME#x
S48
NEXT AOB_FRAME DETECTED FROM ADTS HEADER OF AOB_FRAME#x
S49
#x ← #x + 1
S50
S51
AOB_FRAME#x OUTPUTTED TO THE DESCRAMBLER 7
S52
play_time ← play_time + PLAYBACK PERIOD OF AOB_FRAME#x
play_data ← play_data + DATA LENGTH OF AOB_FRAME#x
S53
#x = "FNs_Last_ TMSRTE" AND Play_Data = SZ_DATA?
No
Yes
S55
#z ← #z + 1
1
No
S54
HAS THE USER PRESSED A KEY ASIDE FROM THE "Play" KEY ?
Yes
5
END

FIG. 59A



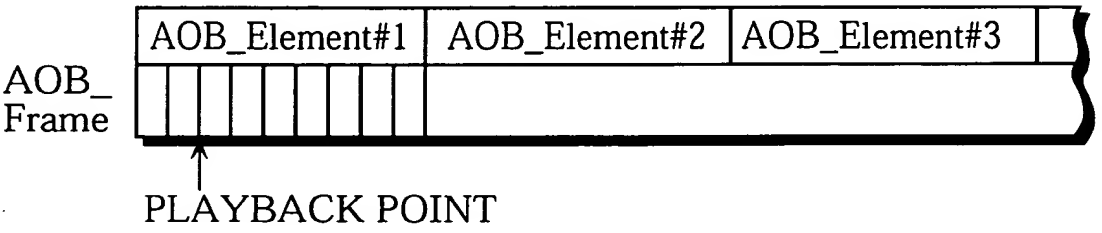
PLAYBACK TIME CODE=00:00:00. 000

FIG. 59B



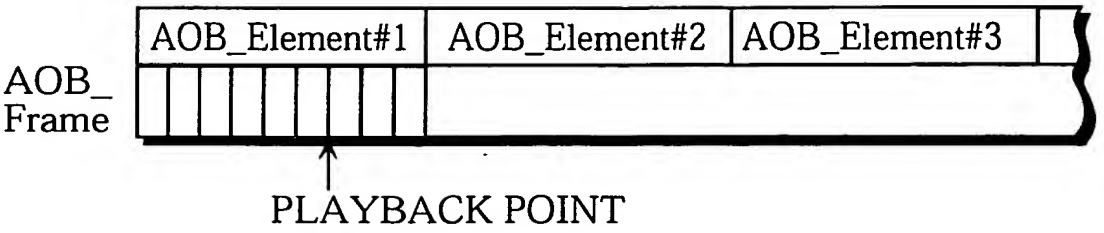
PLAYBACK TIME CODE=00:00:00. 020

FIG. 59C



PLAYBACK TIME CODE=00:00:00. 040

FIG. 59D



PLAYBACK TIME CODE=00:00:00. 120

FIG. 60

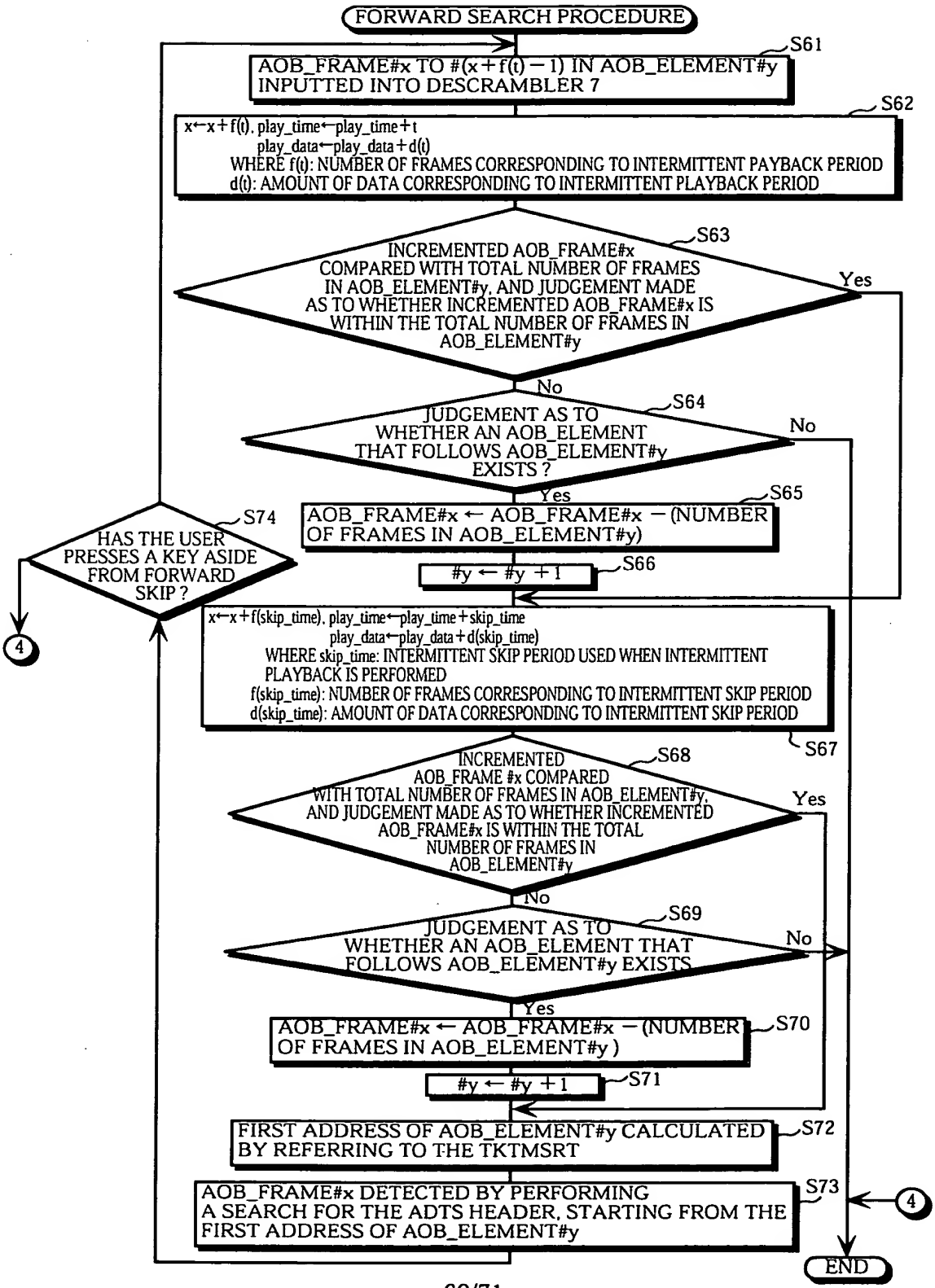
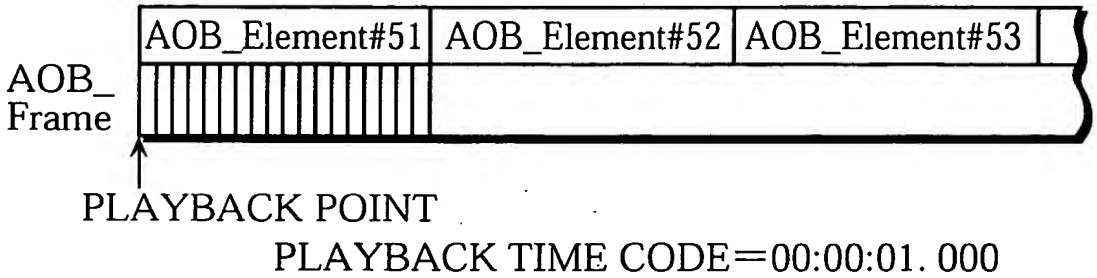
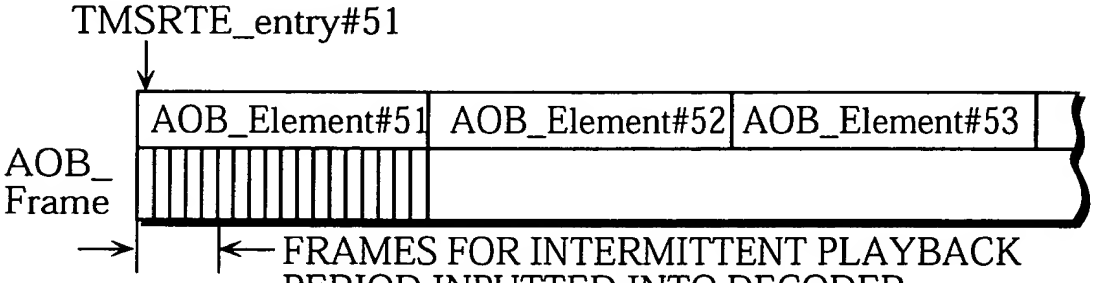

FORWARD SEARCH PROCEDURE
S61
AOB_FRAME#x TO #(x+f(t)−1) IN AOB_ELEMENT#y INPUTTED INTO DESCRAMBLER 7
S62
x←x+f(t), play_time←play_time+t
play_data←play_data+d(t)
WHERE f(t): NUMBER OF FRAMES CORRESPONDING TO INTERMITTENT PAYBACK PERIOD
d(t): AMOUNT OF DATA CORRESPONDING TO INTERMITTENT PLAYBACK PERIOD
S63
INCREMENTED AOB_FRAME#x COMPARED WITH TOTAL NUMBER OF FRAMES IN AOB_ELEMENT#y, AND JUDGEMENT MADE AS TO WHETHER INCREMENTED AOB_FRAME#x IS WITHIN THE TOTAL NUMBER OF FRAMES IN AOB_ELEMENT#y
Yes
No
S64
JUDGEMENT AS TO WHETHER AN AOB_ELEMENT THAT FOLLOWS AOB_ELEMENT#y EXISTS ?
No
Yes
S65
AOB_FRAME#x ← AOB_FRAME#x − (NUMBER OF FRAMES IN AOB_ELEMENT#y)
S66
#y ← #y +1
S74
HAS THE USER PRESSES A KEY ASIDE FROM FORWARD SKIP ?
4
x←x+f(skip_time), play_time←play_time+skip_time
play_data←play_data+d(skip_time)
WHERE skip_time: INTERMITTENT SKIP PERIOD USED WHEN INTERMITTENT PLAYBACK IS PERFORMED
f(skip_time): NUMBER OF FRAMES CORRESPONDING TO INTERMITTENT SKIP PERIOD
d(skip_time): AMOUNT OF DATA CORRESPONDING TO INTERMITTENT SKIP PERIOD
S67
S68
INCREMENTED AOB_FRAME #x COMPARED WITH TOTAL NUMBER OF FRAMES IN AOB_ELEMENT#y, AND JUDGEMENT MADE AS TO WHETHER INCREMENTED AOB_FRAME#x IS WITHIN THE TOTAL NUMBER OF FRAMES IN AOB_ELEMENT#y
Yes
No
S69
JUDGEMENT AS TO WHETHER AN AOB_ELEMENT THAT FOLLOWS AOB_ELEMENT#y EXISTS
No
Yes
S70
AOB_FRAME#x ← AOB_FRAME#x − (NUMBER OF FRAMES IN AOB_ELEMENT#y)
S71
#y ← #y +1
S72
FIRST ADDRESS OF AOB_ELEMENT#y CALCULATED BY REFERRING TO THE TKTMSRT
S73
AOB_FRAME#x DETECTED BY PERFORMING A SEARCH FOR THE ADTS HEADER, STARTING FROM THE FIRST ADDRESS OF AOB_ELEMENT#y
4
END

FIG. 61A



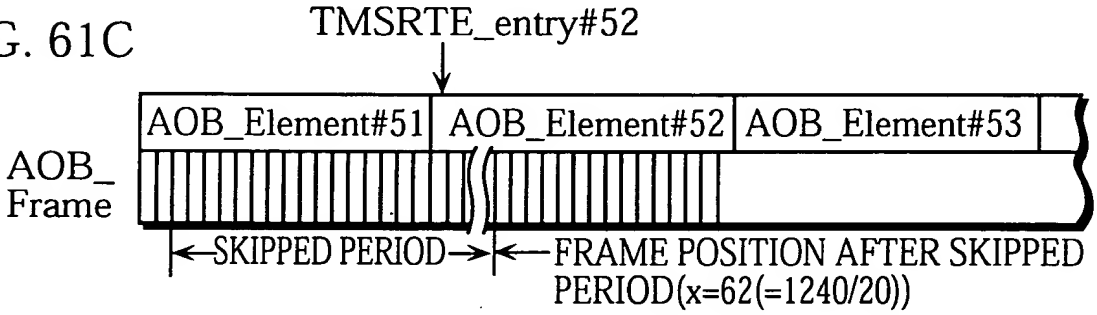
PLAYBACK TIME CODE=00:00:01. 000

FIG. 61B



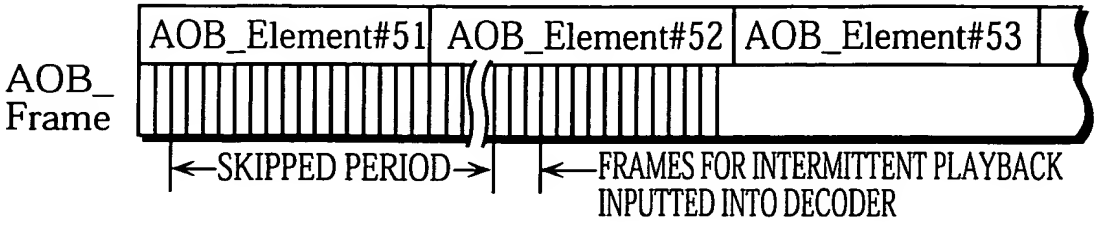
PLAYBACK TIME CODE=00:00:01. 240

FIG. 61C



PLAYBACK TIME CODE=00:00:03. 240(2.000sec+1.240sec)

FIG. 61D



PLAYBACK TIME CODE=00:00:03. 480

FIG. 62A

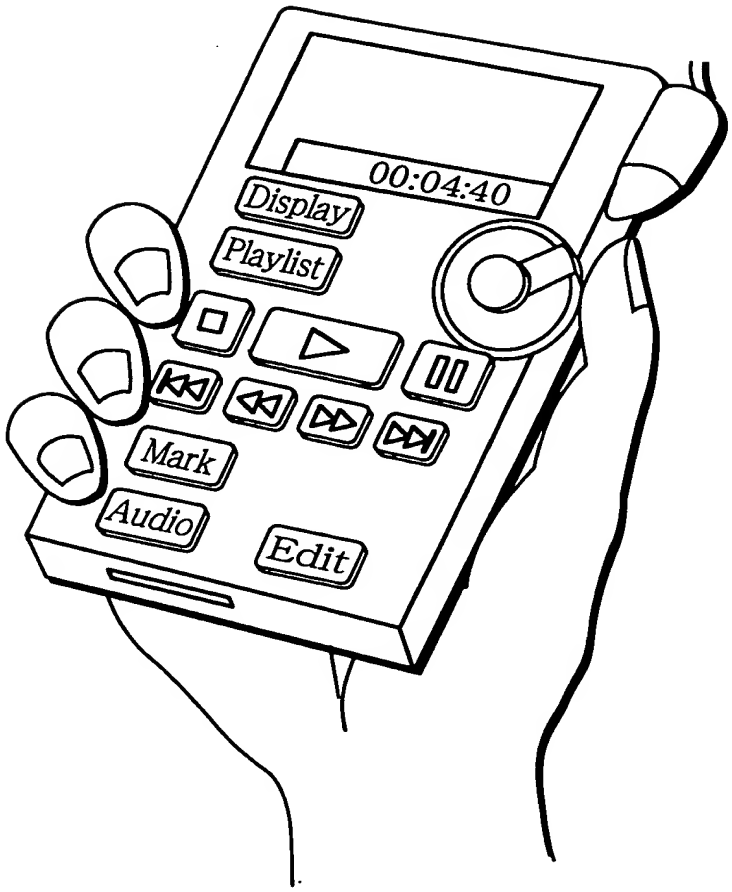
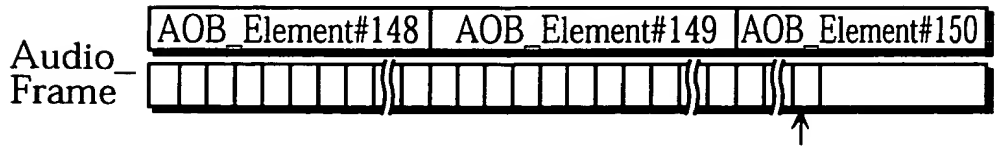


FIG. 62B

BIT	FNs_1st_TMSRTE	80
	FNs_Last_TMSRTE	50
	FNs_Middle_TMSRTE	94



PLAYBACK TIME CODE=00:04:40 (=280sec)
280sec=(80(=FNs_1st_TMSRTE)+148*94
(=FNs_Middle_TMSRTE)+8*20msec

FRAME POSITION
AT WHICH PLAYBACK
SHOULD START

FIG. 63

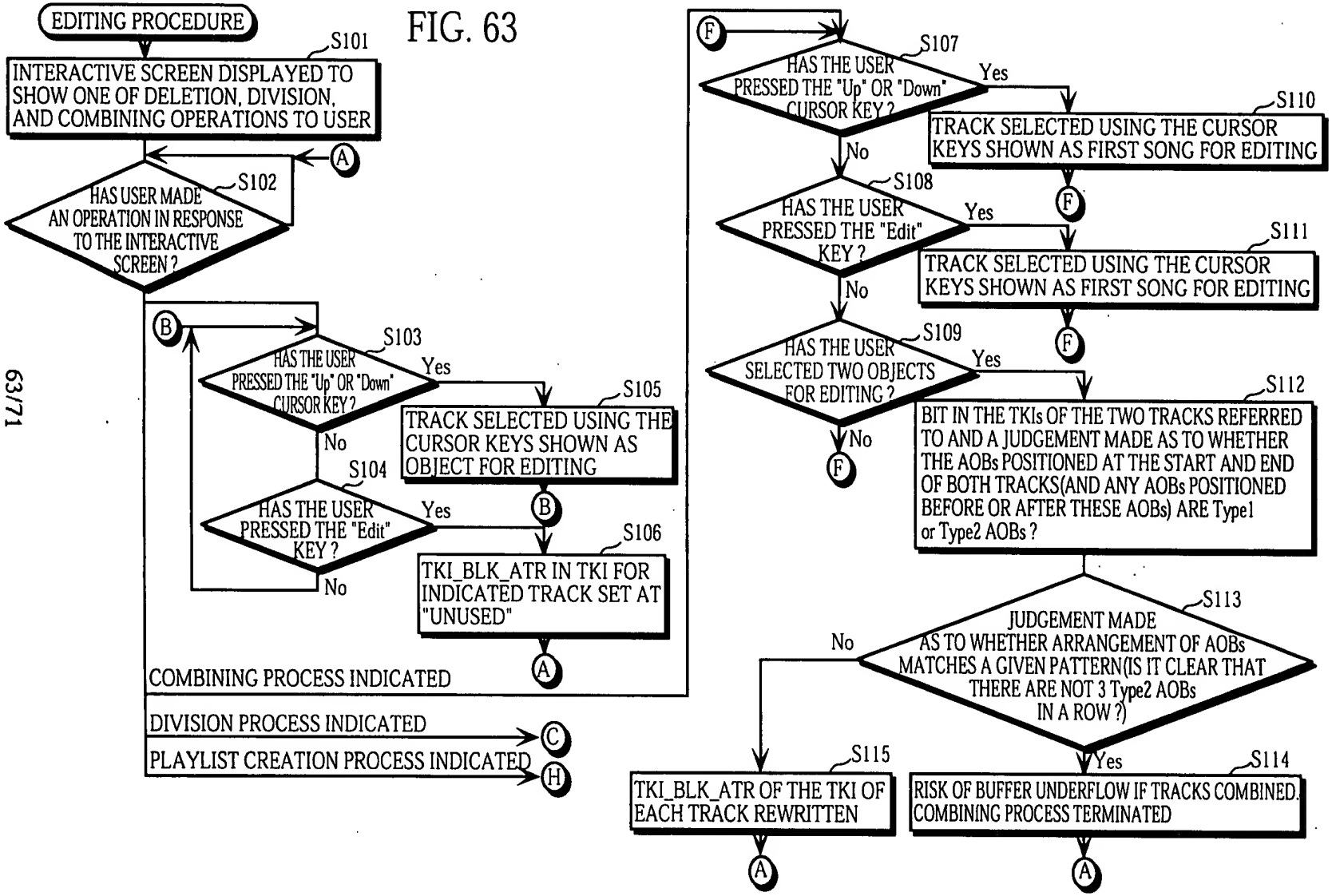
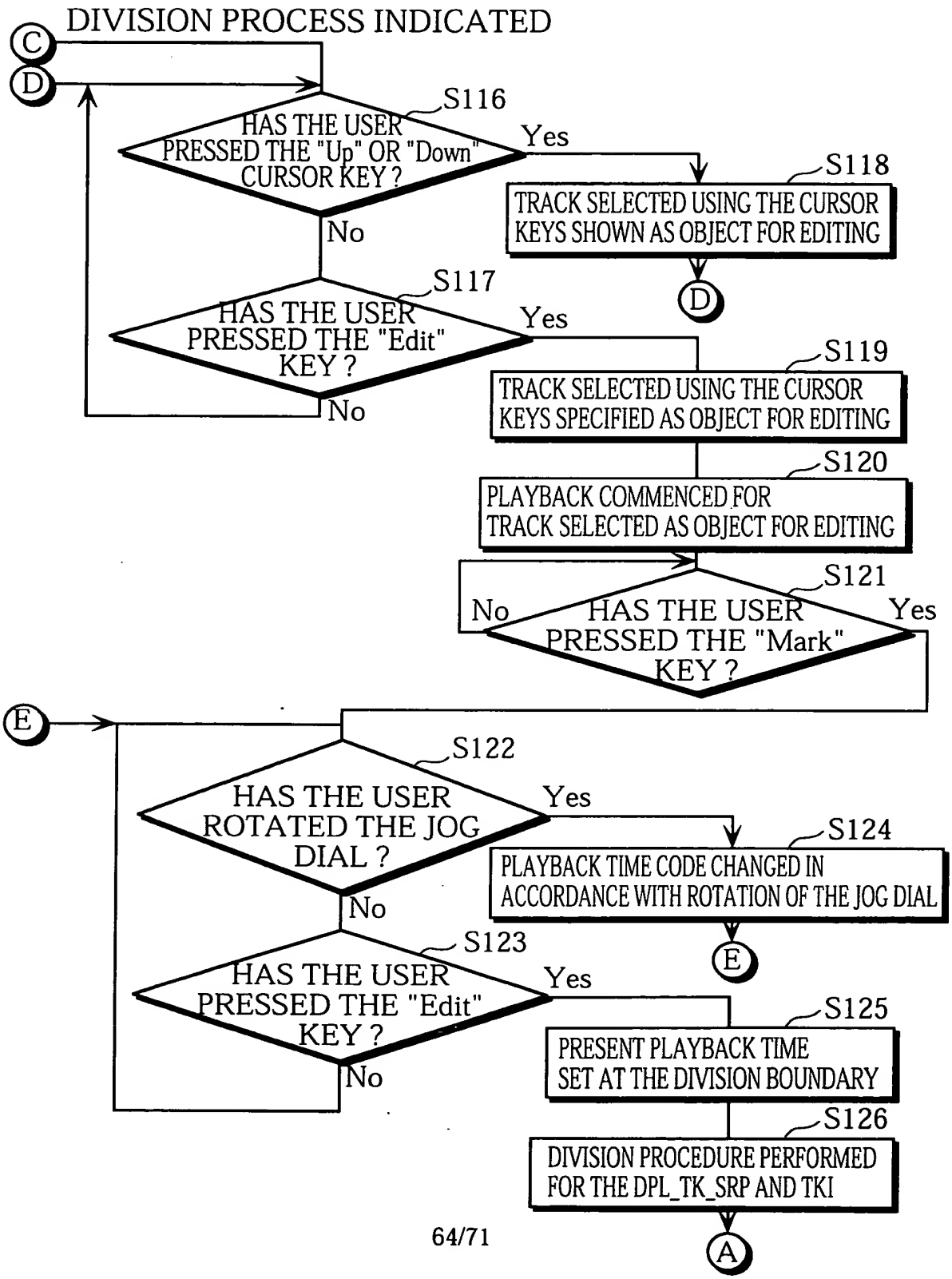
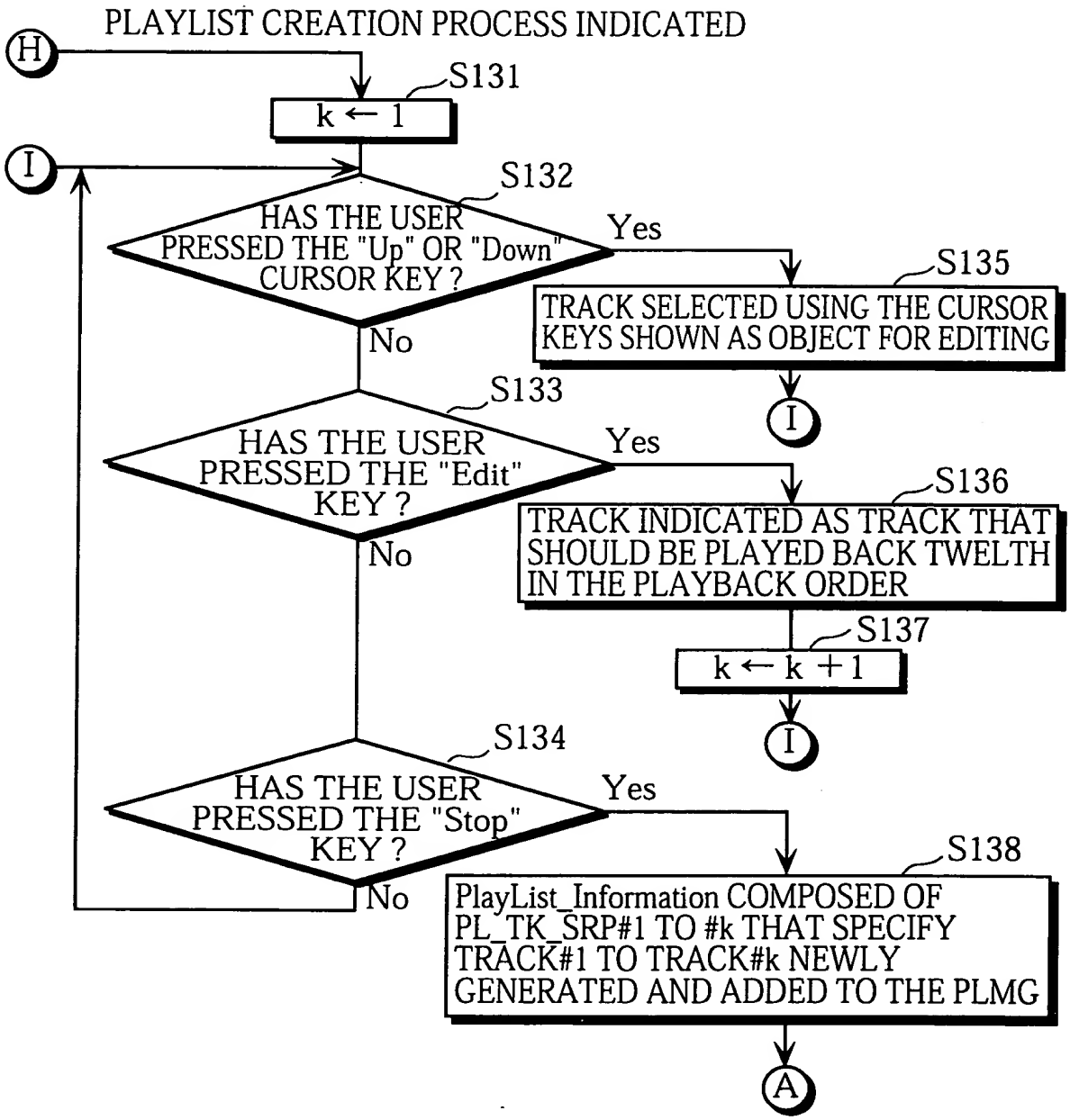

EDITING PROCEDURE
S101
INTERACTIVE SCREEN DISPLAYED TO SHOW ONE OF DELETION, DIVISION, AND COMBINING OPERATIONS TO USER
A
S102
HAS USER MADE AN OPERATION IN RESPONSE TO THE INTERACTIVE SCREEN ?
B
S103
HAS THE USER PRESSED THE "Up" OR "Down" CURSOR KEY ?
Yes
S105
TRACK SELECTED USING THE CURSOR KEYS SHOWN AS OBJECT FOR EDITING
No
S104
HAS THE USER PRESSED THE "Edit" KEY ?
Yes
B
S106
TKI_BLK_ATR IN TKI FOR INDICATED TRACK SET AT "UNUSED"
No
A
COMBINING PROCESS INDICATED
DIVISION PROCESS INDICATED
C
PLAYLIST CREATION PROCESS INDICATED
H
F
S107
HAS THE USER PRESSED THE "Up" OR "Down" CURSOR KEY ?
Yes
S110
TRACK SELECTED USING THE CURSOR KEYS SHOWN AS FIRST SONG FOR EDITING
No
S108
HAS THE USER PRESSED THE "Edit" KEY ?
Yes
F
S111
TRACK SELECTED USING THE CURSOR KEYS SHOWN AS FIRST SONG FOR EDITING
No
S109
HAS THE USER SELECTED TWO OBJECTS FOR EDITING ?
Yes
F
S112
BIT IN THE TKIs OF THE TWO TRACKS REFERRED TO AND A JUDGEMENT MADE AS TO WHETHER THE AOBs POSITIONED AT THE START AND END OF BOTH TRACKS(AND ANY AOBs POSITIONED BEFORE OR AFTER THESE AOBs) ARE Type1 or Type2 AOBs ?
No
F
S113
JUDGEMENT MADE AS TO WHETHER ARRANGEMENT OF AOBs MATCHES A GIVEN PATTERN(IS IT CLEAR THAT THERE ARE NOT 3 Type2 AOBs IN A ROW ?)
No
S115
TKI_BLK_ATR OF THE TKI OF EACH TRACK REWRITTEN
A
Yes
S114
RISK OF BUFFER UNDERFLOW IF TRACKS COMBINED. COMBINING PROCESS TERMINATED
A

FIG. 64



0956001-052600

FIG. 65



0058060 - 052600

FIG. 66

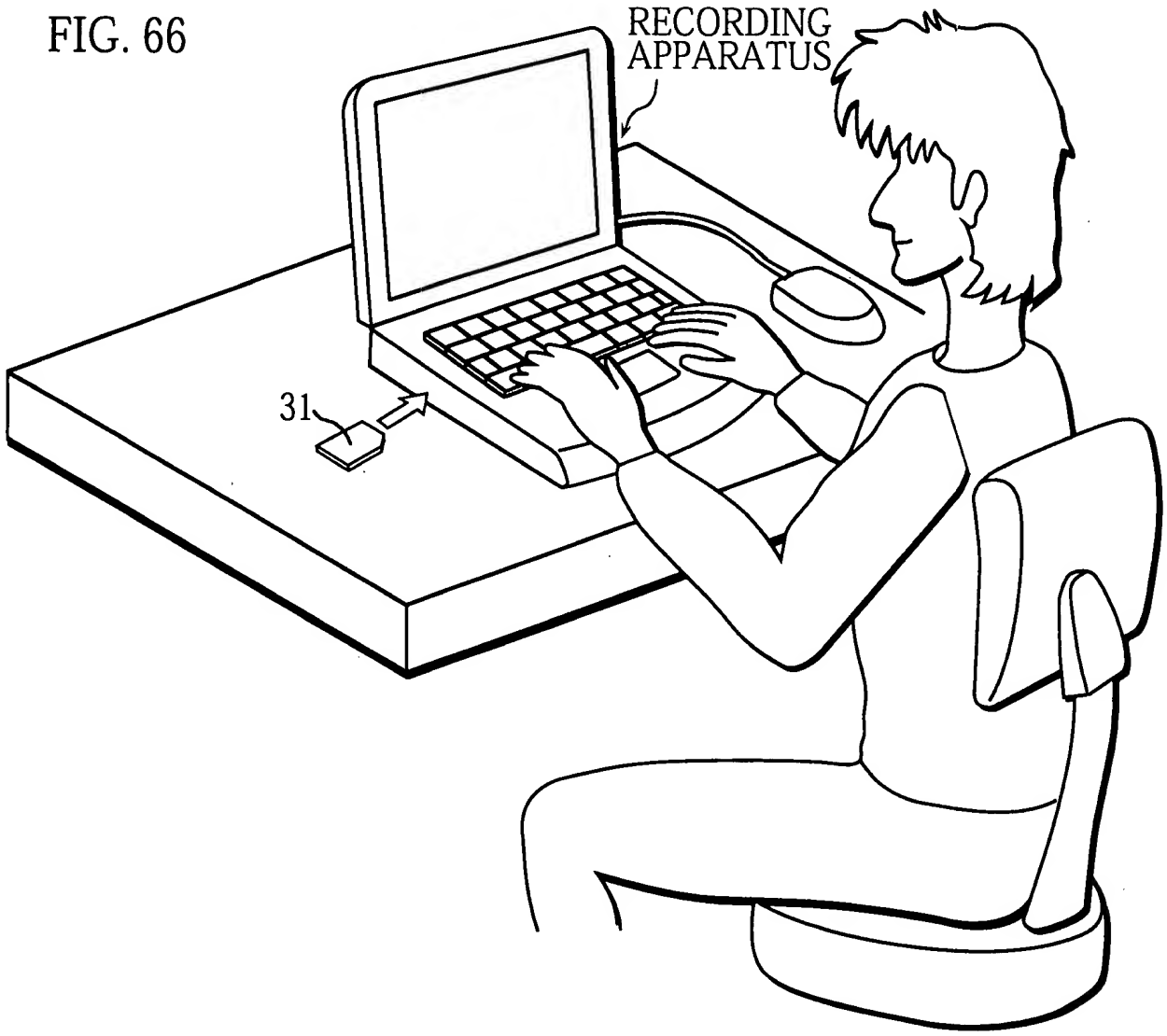


FIG. 67

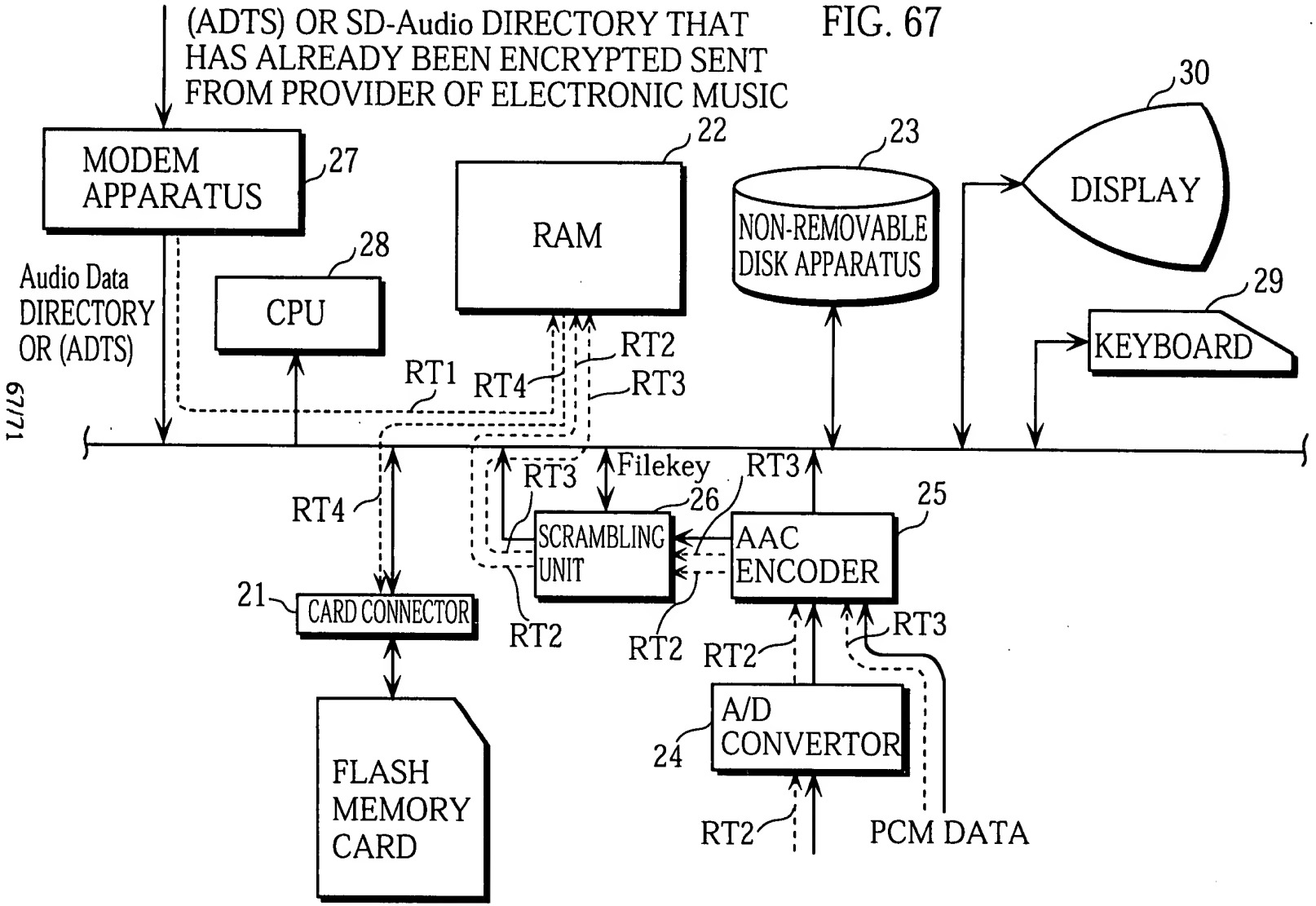

(ADTS) OR SD-Audio DIRECTORY THAT HAS ALREADY BEEN ENCRYPTED SENT FROM PROVIDER OF ELECTRONIC MUSIC
MODEM APPARATUS
27
22
RAM
23
NON-REMOVABLE DISK APPARATUS
30
DISPLAY
29
KEYBOARD
28
CPU
Audio Data DIRECTORY OR (ADTS)
RT1
RT4
RT2
RT3
Filekey
RT3
RT3
RT4
26
SCRAMBLING UNIT
25
AAC ENCODER
21
CARD CONNECTOR
RT2
RT2
RT2
RT3
A/D CONVERTOR
24
FLASH MEMORY CARD
RT2
PCM DATA
67/71

FIG. 68

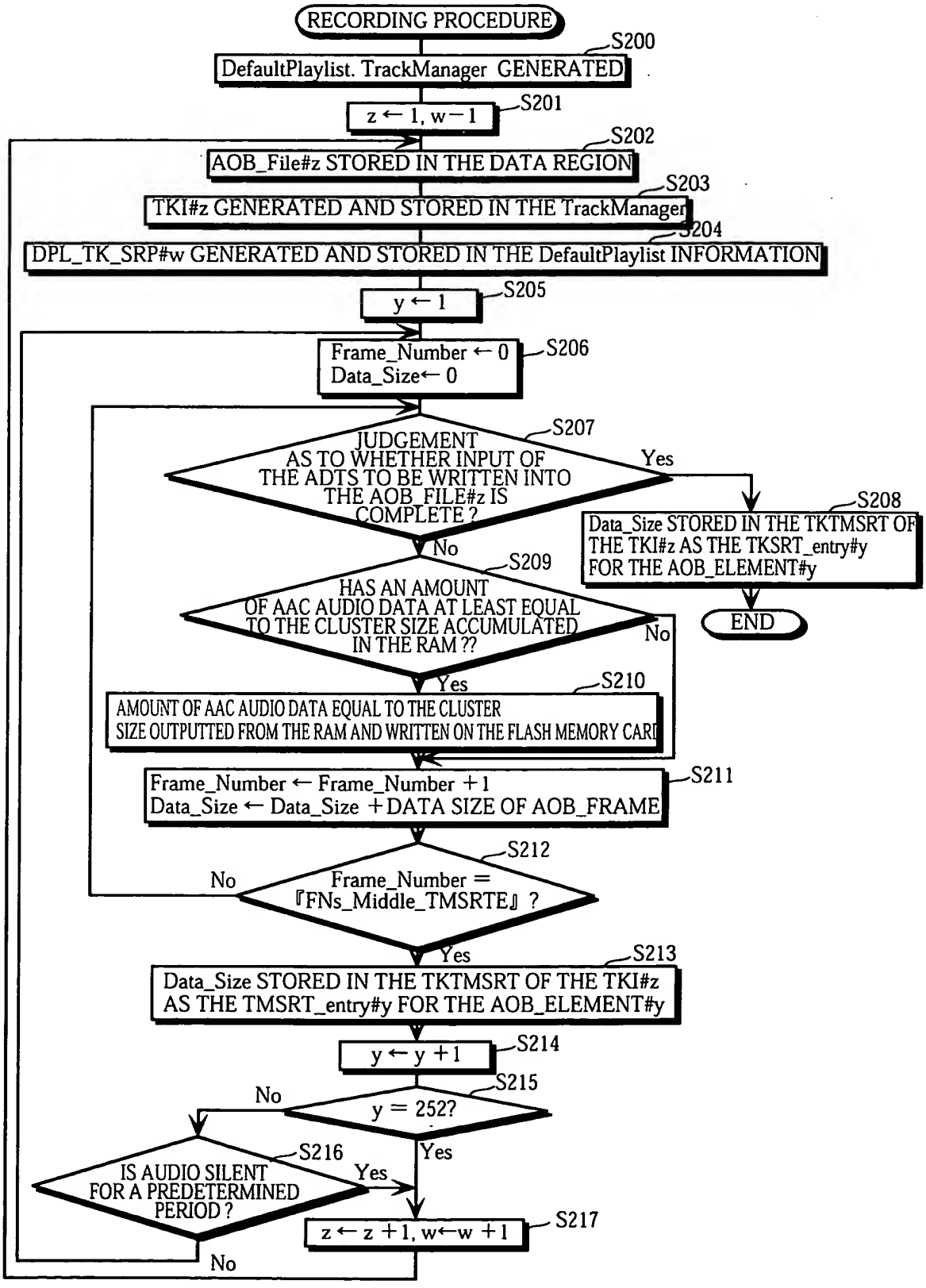

RECORDING PROCEDURE
S200
DefaultPlaylist. TrackManager GENERATED
S201
z ← 1, w − 1
S202
AOB_File#z STORED IN THE DATA REGION
S203
TKI#z GENERATED AND STORED IN THE TrackManager
S204
DPL_TK_SRP#w GENERATED AND STORED IN THE DefaultPlaylist INFORMATION
S205
y ← 1
S206
Frame_Number ← 0
Data_Size← 0
S207
JUDGEMENT AS TO WHETHER INPUT OF THE ADTS TO BE WRITTEN INTO THE AOB_FILE#z IS COMPLETE ?
Yes
No
S208
Data_Size STORED IN THE TKTMSRT OF THE TKI#z AS THE TKSRT_entry#y FOR THE AOB_ELEMENT#y
END
S209
HAS AN AMOUNT OF AAC AUDIO DATA AT LEAST EQUAL TO THE CLUSTER SIZE ACCUMULATED IN THE RAM ??
No
Yes
S210
AMOUNT OF AAC AUDIO DATA EQUAL TO THE CLUSTER SIZE OUTPUTTED FROM THE RAM AND WRITTEN ON THE FLASH MEMORY CARD
S211
Frame_Number ← Frame_Number +1
Data_Size ← Data_Size +DATA SIZE OF AOB_FRAME
S212
No
Frame_Number = 『FNs_Middle_TMSRTE』 ?
Yes
S213
Data_Size STORED IN THE TKTMSRT OF THE TKI#z AS THE TMSRT_entry#y FOR THE AOB_ELEMENT#y
S214
y ← y +1
S215
No
y = 252?
Yes
S216
IS AUDIO SILENT FOR A PREDETERMINED PERIOD ?
Yes
S217
z ← z +1, w←w +1
No

FIG. 69

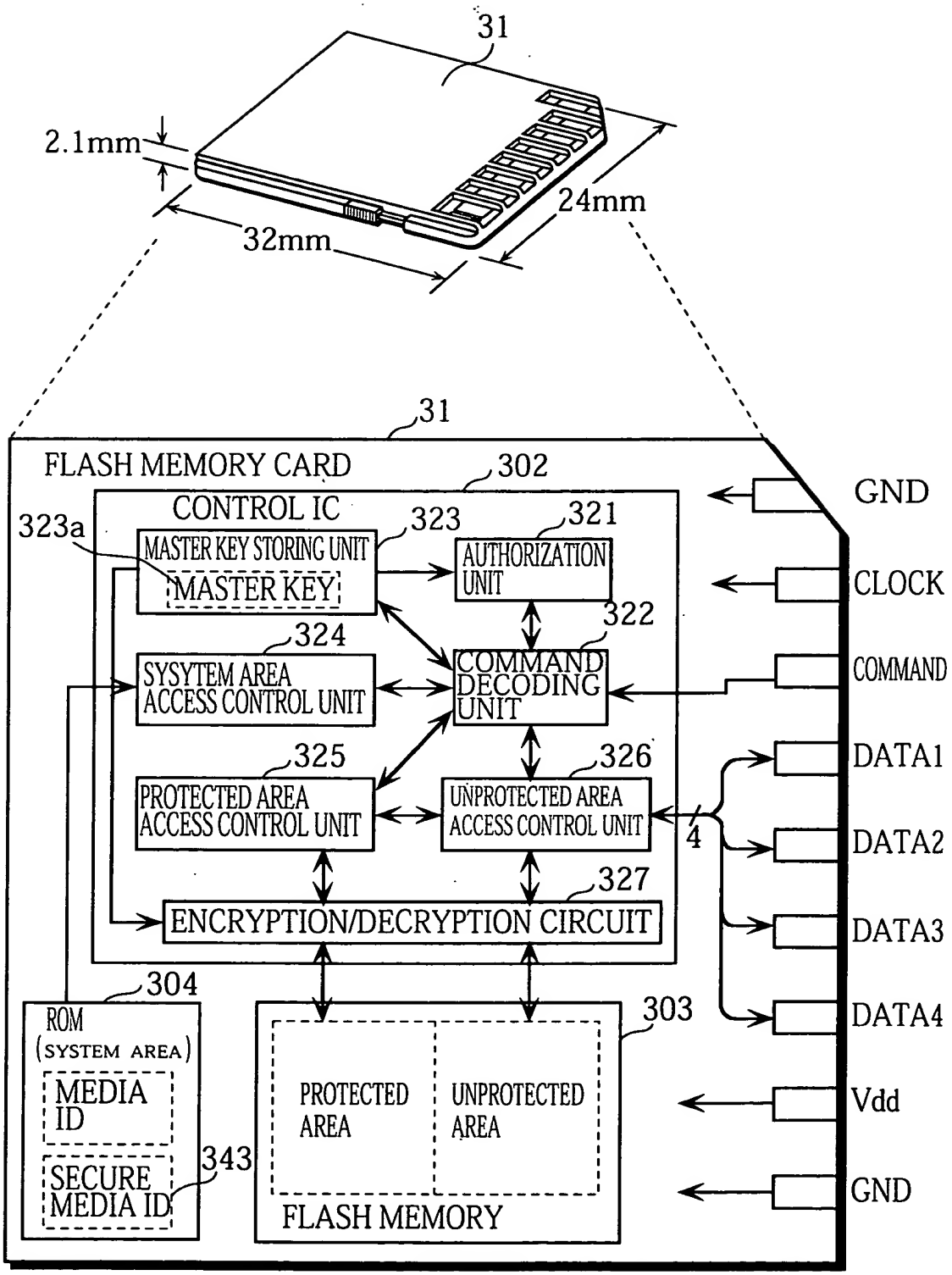

31
2.1mm
32mm
24mm
31
FLASH MEMORY CARD
302
CONTROL IC
323a
323
321
MASTER KEY STORING UNIT
MASTER KEY
AUTHORIZATION UNIT
322
324
SYSYTEM AREA ACCESS CONTROL UNIT
COMMAND DECODING UNIT
325
326
PROTECTED AREA ACCESS CONTROL UNIT
UNPROTECTED AREA ACCESS CONTROL UNIT
4
327
ENCRYPTION/DECRYPTION CIRCUIT
304
ROM (SYSTEM AREA)
MEDIA ID
SECURE MEDIA ID
343
303
PROTECTED AREA
UNPROTECTED AREA
FLASH MEMORY
GND
CLOCK
COMMAND
DATA1
DATA2
DATA3
DATA4
Vdd
GND

FIG. 70

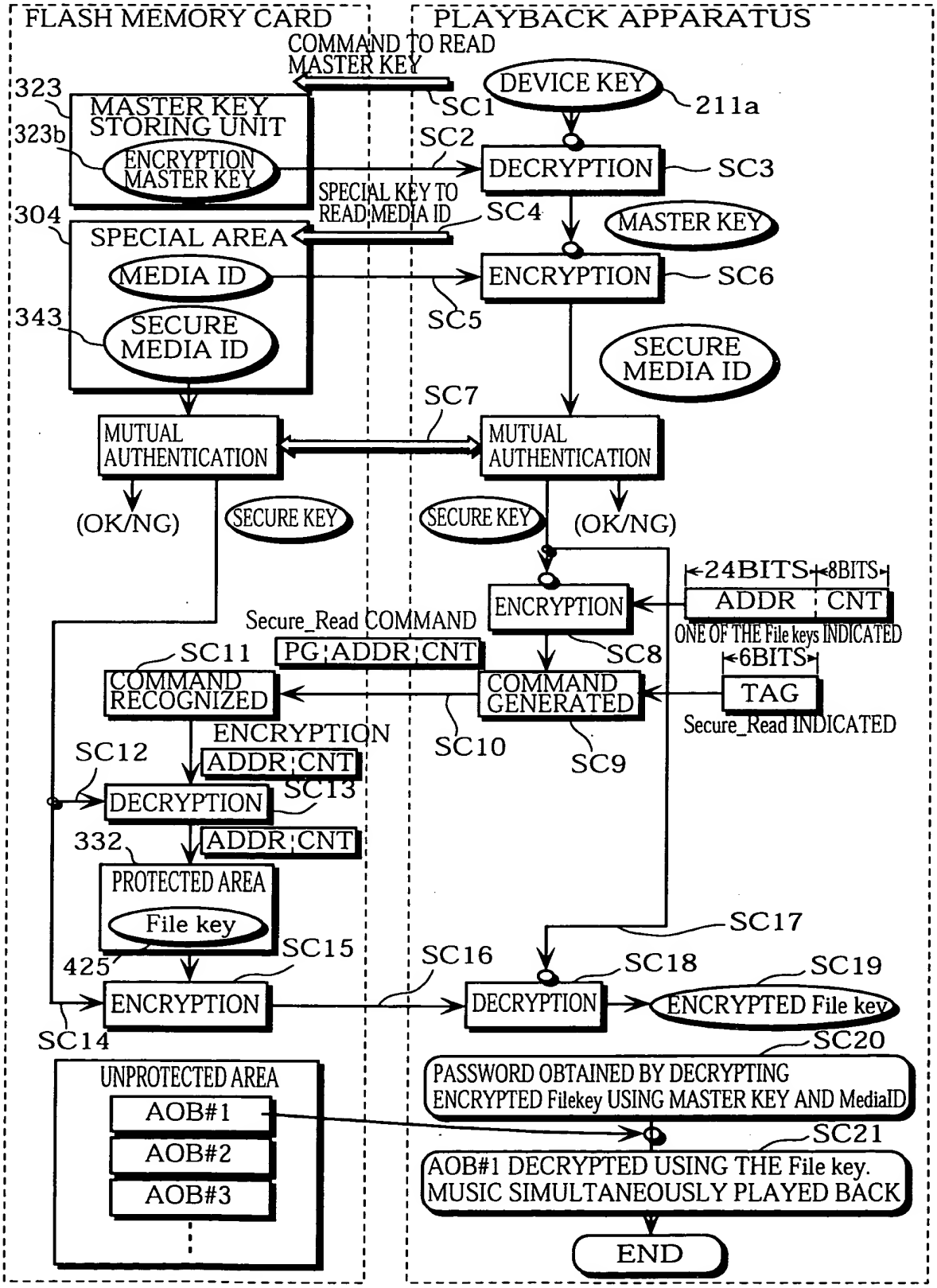
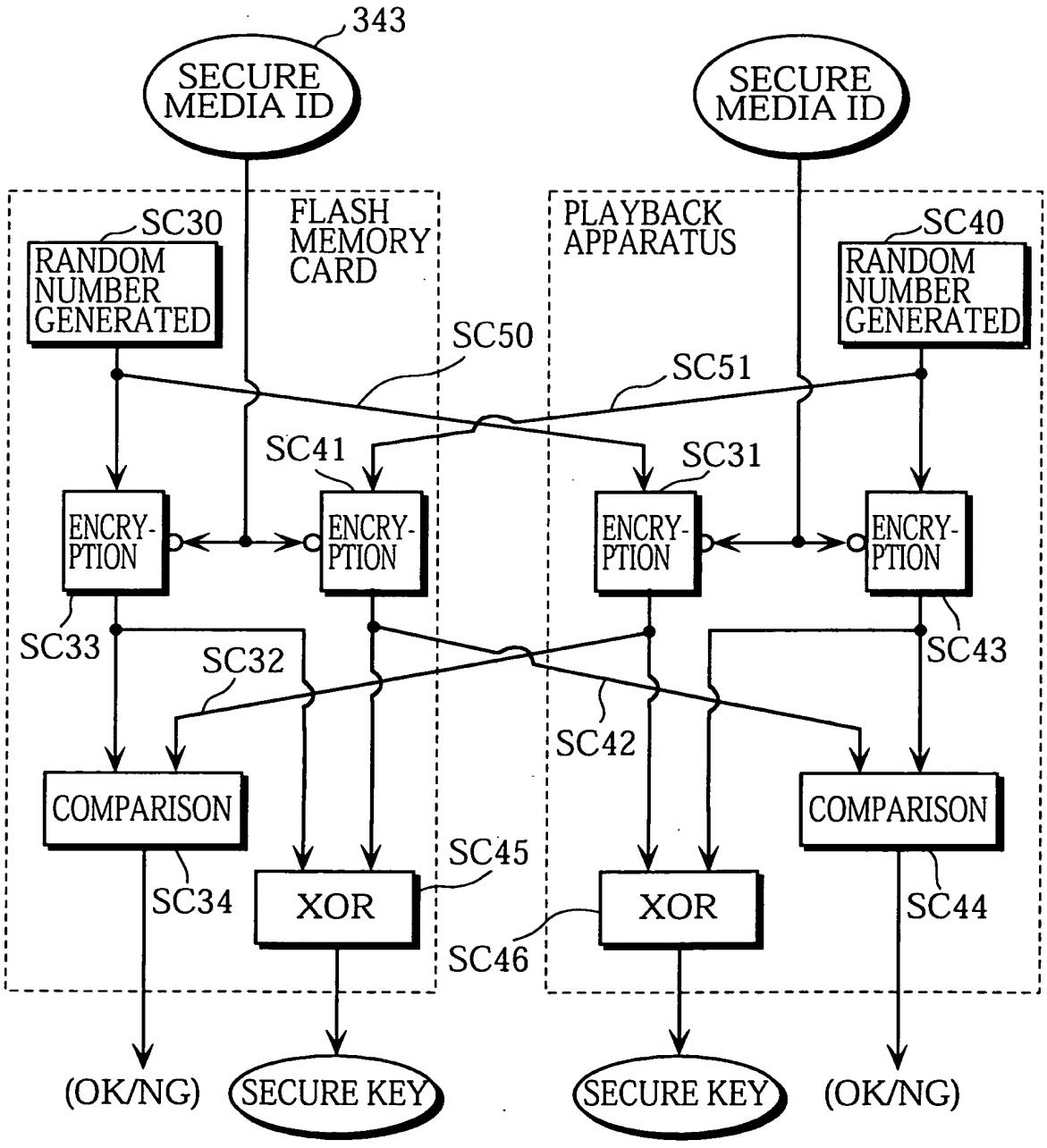

FLASH MEMORY CARD
PLAYBACK APPARATUS
COMMAND TO READ MASTER KEY
SC1
DEVICE KEY
211a
323
MASTER KEY STORING UNIT
323b
ENCRYPTION MASTER KEY
SC2
DECRYPTION
SC3
SPECIAL KEY TO READ MEDIA ID
SC4
304
SPECIAL AREA
MASTER KEY
MEDIA ID
ENCRYPTION
SC6
SC5
343
SECURE MEDIA ID
SECURE MEDIA ID
SC7
MUTUAL AUTHENTICATION
MUTUAL AUTHENTICATION
(OK/NG)
SECURE KEY
SECURE KEY
(OK/NG)
24BITS
8BITS
ADDR
CNT
ENCRYPTION
ONE OF THE File keys INDICATED
Secure_Read COMMAND
PG ADDR CNT
SC8
6BITS
SC11
COMMAND RECOGNIZED
COMMAND GENERATED
TAG
Secure_Read INDICATED
ENCRYPTION
SC10
SC9
SC12
ADDR CNT
DECRYPTION
SC13
332
ADDR CNT
PROTECTED AREA
File key
SC17
425
SC15
SC16
SC18
SC19
ENCRYPTION
DECRYPTION
ENCRYPTED File key
SC14
SC20
UNPROTECTED AREA
PASSWORD OBTAINED BY DECRYPTING ENCRYPTED Filekey USING MASTER KEY AND MediaID
AOB#1
AOB#2
AOB#3
SC21
AOB#1 DECRYPTED USING THE File key. MUSIC SIMULTANEOUSLY PLAYED BACK
END

FIG. 71


343
SECURE MEDIA ID
SECURE MEDIA ID
FLASH MEMORY CARD
PLAYBACK APPARATUS
SC30
RANDOM NUMBER GENERATED
SC40
RANDOM NUMBER GENERATED
SC50
SC51
SC41
SC31
ENCRY-PTION
ENCRY-PTION
ENCRY-PTION
ENCRY-PTION
SC33
SC32
SC43
SC42
COMPARISON
COMPARISON
SC45
SC34
XOR
XOR
SC44
SC46
(OK/NG)
SECURE KEY
SECURE KEY
(OK/NG)